CITY OF ISSAQUAH WASHINGTON

Community Planning and Development
130 East Sunset Way | P.O. Box 1307
Issaquah, WA 98027
425-837-3100
issaquahwa.gov

SHORELINE MANAGEMENT ACT
SUBSTANTIAL DEVELOPMENT PERMIT

TO: Janelle Walker, Issaquah School District
5150 220th Avenue SE
Issaquah, WA 98029

PROJECT: Holly Street Permanent Creekbank Repair

PERMIT NUMBER: SHO21-00018

DATE OF DECISION: May 23, 2022

REQUEST: The project will install bio-engineered creek bank stabilization along 130 feet of Issaquah Creek. The measures will include large woody debris and habitat structures anchored into the stream bank to provide erosion protection. The stream bank will be revegetated to provide long term stabilization.

LOCATION: 565 NW Holly Street, Issaquah, WA 98027

SUBAREA: Newport

SHORELINE JURISDICTION: Issaquah Creek Shoreline Urban Conservancy

ZONING: Community Facilities – Facilities (CF-F)

DECISION MADE:
On May 23, 2022, the Community Planning and Development Department approved the Shoreline Substantial Development Permit application. Approval of this application is based on the November 3, 2021, submittal and is subject to the following conditions:

1. All instream construction activities must occur during the fish window, July 1st through August 31st.

2. Installation of a coffer dam and fish removal required prior to construction activities within the ordinary high-water mark of Issaquah Creek.

3. If historic, cultural, or archaeological sites or artifacts are inadvertently discovered during shoreline development, work on that portion of the development site

shall be stopped immediately, the site secured, and the discovery reported as soon as possible to the Planning Director/Manager. Upon notification of such find, the property owner shall notify the Washington State Department of Archaeology and Historic Preservation, and the Planning Director/Manager shall notify the historic preservation officer and shall require a site investigation to determine the significance of the discovery. Based upon the findings of the site investigation and consultation with the historic preservation officer and the Washington State Department of Archaeology and Historic Preservation, the Planning Director/Manager may require that an immediate site assessment be conducted or may allow stopped work to resume.

4. Construction plan-set shall contain a Temporary Erosion and Sediment Control (TESC) per IMC 16.26.050(C)(4).

5. The site will follow the US Army Corps of Engineers site monitoring requirement of 10-years.

6. For Construction permits adjust OHWM to the top of bank where the streambank is vertical or undercut by the stream. This shall be shown in the subsequent construction permits.

7. Modify streambank mitigation performance standards to be specific to each distinct planting area to better reflect the objectives of the individual areas. This information shall be provided in the subsequent construction permit.

8. Additional shrub and groundcover species to restoration area B to meet the plant species and structural diversity goal. This shall be provided in the subsequent construction permit.

9. Approval from WDFW and US Army Corps is required. Any conditions placed on their approval will become conditions of the shoreline permit approval. A copy of both approvals shall be provided prior to issuance of construction permits.

Reasons for Decision:

1. The proposed development falls within the jurisdiction of the Issaquah Shoreline Master Program (SMP) because it is located within 200 feet of the Ordinary High-Water Mark of Lake Sammamish. Developments within this area require a permit to review for consistency with the SMP.

2. Shoreline Stabilization is a permitted use in the Issaquah Creek Urban Conservancy Environmental Designation per the City’s Adopted Shoreline Master Program Table 1 Permitted Uses (pg. 39).

Shoreline Use		Proposed Shoreline Environment Designations					
	Shoreline Commercial/ Mixed Use	High Intensity Transportation	Lake Sammamish Shoreline Residential	Issaquah Creek Shoreline Residential	Lake Sammamish Urban Conservancy	Issaquah Creek Urban Conservancy	Natural
Shoreline Modifications							
Dredging[1]	C	C	C	C	C	C	C
Filling and Excavation							
Landward of OHWM	P	P	P	P	P	P	P
Filling Waterward of OHWM[4]	C	C	C	C	C	C	C
In-stream Structures	P	P	N/A	P	N/A	P	P
Shoreline Stabilization	P	P	P	P	P	P	P

3. The proposed work does not meet the threshold for exempt from shoreline substantial development permit established in WAC 173-27-040. Therefore, a Shoreline Substantial Development Permit is required.
4. A Shoreline Substantial Development Permit is authorized to be reviewed under the Administrative Review Process Level 2 review in accordance with the Land Use Code IMC Section 18.04.360. F. A Shoreline Substantial Development permit was applied for November 3, 2021 (Exhibit 1).
5. Public notification was provided to residences with 300-feet of the proposed development per IMC 18.04.180 (Exhibit 2).
6. Per IMC 18.10.410.F a neighborhood environmental meeting is required for all Level 2 permits, which require a critical area study. Notification of the meeting was provided to all residences within 300-feet of the proposed development and held April 6, 2022 (Exhibit 4).
7. The following SMP policies and regulations apply to the current proposal:

5.1.2 Shoreline Use Regulations

1. All uses in the shoreline shall comply with the City's land use code IMC Title 18 and this program.
2. The shoreline use table (Table 1 in Chapter 4) defines those uses that are permitted outright and those uses that are only permitted as a conditional use. All unclassified uses, such as agriculture, forestry, mining, and non-hatchery-related aquaculture, shall be considered conditional uses and shall be governed by the policies in WAC 173-26.

   Staff Findings: Shoreline Stabilization is a permitted use in all Shoreline Environmental Designations per Table 1 (pg. 39) of the City's adopted Shoreline Master Program (SMP).

5.2 Archeological, Historical and Cultural Resources Use Regulations

1. An application for a shoreline permit or request for a shoreline exemption permit for a development proposal located on or adjacent to a historic or cultural resource shall be reviewed pursuant to the requirements of Certificate of Appropriateness and Protection and Preservation of Landmarks, Landmark Sites and Districts found within Title 18 and this Program.
2. An application for a shoreline permit or request for a shoreline exemption permit for a development proposal located on or adjacent to an area documented to contain archeological resources shall be reviewed pursuant to this Program and shall require a site inspection or evaluation by a professional archeologist in coordination with affected Indian tribes.
3. Whenever historic, cultural, or archaeological sites or artifacts are inadvertently discovered during shoreline development, work on that portion of the development site shall be stopped immediately, the site secured, and the discovery reported as soon as possible to the Planning Director/Manager. Upon notification of such find, the property owner shall notify the Washington State Department of Archaeology and Historic Preservation, and the Planning Director/Manager shall notify the historic preservation officer and shall require a site investigation to determine the significance of the discovery. Based upon the findings of the site investigation and consultation with the historic preservation officer and the Washington State Department of Archaeology and Historic Preservation, the Planning Director/Manager may require that an immediate site assessment be conducted or may allow stopped work to resume.

   Staff Findings: No documented historic or cultural resource have been identified near the site. The SEPA determination and supporting documents were provided to the State's Department of Archeology and Historic Preservation (DAHP). A condition is placed on this permit for inadvertent discovered (See Condition 3).

5.7 Vegetation Conservation Regulations

2. Vegetation clearing should be limited to the minimum necessary to accommodate approved shoreline uses and developments and shall comply with the standards established in Tables 1 and 2 in Chapter 4 as well as the use-specific regulations contained in this Program.
3. Vegetation conservation standards shall not limit or restrict the removal of hazard trees, provided the hazard tree removal is consistent with IMC Title 18, specifically Landscaping and Tree Preservation.

   Staff Findings: The site contains some invasive species, which will be removed. There are 7 trees whose roots have been compromised with the stream bank failure and are considered hazardous trees to the school. An arborist report has recommended removal of the trees and the trees will be incorporated into the streambank stabilization.

5.8 Flood Hazard Reduction Regulations

1. All development in the shoreline shall comply with the City's Areas of Special Flood Hazard (IMC 16.36), Stormwater Management Policy (IMC 13.28), Critical Area Regulations incorporated in section 1.5.5, and the National Flood Insurance Program.

2. Development in FEMA designated floodplains and floodways, channel migration areas, and/or riparian buffers shall be required to demonstrate no adverse impact on habitat for

fish species listed as threatened or endangered under the federal Endangered Species Act.

Staff Findings: Evaluation of the above regulations was provided with a City of Issaquah Flood Hazard permit FLH20-00005. The referenced flood hazard permit was approved November 10, 2020.

5.16 Fill and Excavation Regulations

3. Development that involves fill or excavation within the shoreline jurisdiction shall obtain a Shoreline Substantial Development permit or Shoreline Conditional Use Permit (as specified in Table 1 Chapter 4), unless exempt by RCW 90.58.030.

4.a Fill shall be permitted only where it is demonstrated that the proposed action will not: Result in significant ecological damage to water quality, fish, and/or wildlife habitat.

6.d Filling waterward of the OHWM may be allowed when necessary to support the following: Bio-engineered shoreline stabilization projects, including bio-engineered shoreline stabilization associated with private residential developments.

9. A temporary erosion and sediment control (TESC) plan shall be provided for all proposed fill and excavation activities.

Staff Findings: A Shoreline Substantial Development Permit was applied for to allow the construction of a bio-engineered streambank stabilization. Evaluation was provided in the submitted geo-technical and stream studies (Exhibit 5 & 6). A temporary erosion and sedimentation plan was provided for evaluation. Additional requirements will be provided in the subsequent site work permit (Condition 4).

7.1.3 Shoreline Modification Regulations Fill and Excavation Regulations

1. Bioengineered shoreline stabilization (also known as bio-stabilization) is the preferred method for stabilizing shorelines and shall be permitted.

2.b. New, expanded, or replaced bank stabilization or flood control structures may be allowed when: There is conclusive evidence, documented by a geotechnical analysis and reaffirmed by a peer review that a primary structure is in danger of shoreline erosion caused by currents or waves and not caused by normal sloughing, vegetation removal, or poor drainage.

3. New stream bank stabilization structures shall incorporate features that minimize adverse effects on riparian habitat, salmon spawning and migration, and water quality. Such features shall include native vegetation, large wood, rocks, and other techniques that have been shown mitigate the effects of bank armoring on stream ecology. The City shall approve approaches consistent with Washington Department of Fish and Wildlife bank stabilization guidelines.

4. In assessing compliance with the provisions of this section, the Planning Director/Manager shall require the applicant or project sponsor to provide a geotechnical analysis.

5. Technical reports shall be prepared by a Washington State licensed engineer and/or licensed geologist or engineering geologist and may include a qualified biologist as appropriate. The reports shall be peer reviewed and meet the application requirements of IMC 18.10 and all other procedures for land use permit applications and public notice.

Staff Findings: The proposed development is for a bio-engineered streambank stabilization to repair a portion of the streambank damaged by floods in 2020. A temporary solution was permitted under an emergency shoreline exemption SHO20-00007. The applicants provided a geo-technical report providing evidence bank erosion was caused by Issaquah Creek currents and threatened the school site. The documents were peer-reviewed.

The design of the structure will include native vegetation, large woody debris, and rocks. A portion of the upland buffer will be vegetated with native riparian vegetation. The design of the structure is consistent with WDFW bank stabilization guidelines.

Public Comment

Public notification was provided for this project. All residents within 300' of the proposal were notified. One public comment was received. The comment and responses from the applicant are included as Exhibit 7 in this report. Staff concurs with the applicant's responses except for the monitoring period. The City will monitor the site post construction per the US Army Corps of Engineers requirement of 10 years. (Condition 5)

SEPA: A Determination of Non-Significance (DNS) was issued by the City of Issaquah May 6, 2022. A 14-day comment/appeal period was provided. A copy of the DNS can be found in Exhibit 8

Douglas Yormick

Digitally signed by Douglas Yormick
DN: C=US, E=dougy@issaquahwa.gov, O=City of Issaquah, OU=Community Planning & Development, CN=Douglas Yormick
Date: 2022.05.23 16:39:18-07'00'

May 23, 2022

Doug Yormick, Associate Environmental Planner Date

EXHIBIT LIST:

1. Shoreline Substantial Development application received November 3, 2021
2. Notice of Application and Affidavit of Mailing
3. Shoreline Substantial Development Site Plan received November 3, 2021
4. Notice of Neighborhood Meeting and Affidavit of Mailing
5. Geotechnical report produced by Nelson Geotechnical Associates, provided November 3, 2021
6. Critical Area Study and Buffer Mitigation produced by Wetland Resources provided November 3, 2021
7. Public Comment and Applicant Response
8. SEPA Determination of Non-significance, May 6, 2022

Appeals:

An appeal of this Shoreline Substantial Development Permit (Level 2) must be filed with the Community Planning and Development Department Permit Center within 14-days of this notice of decision, by 5:00 PM on June 6, 2022. A letter of appeal shall include the reasons for the appeal and a $750 filing fee, which is required of appeals.

CITY OF ISSAQUAH WASHINGTON

CITY OF ISSAQUAH

MyBuildingPermit.com a service of eCityGov.net

Land Use Application #1040411 - Holly Street Permanent Creek Bank Repair

Applicant

First Name	Last Name	Company Name
Janelle	Walker	Issaquah School District 411

Number	Street	Apartment or Suite Number	E-mail Address
5150	220th Avenue SE		walkerj2@issaquah.wednet.edu

City	State	Zip	Phone Number	Extension
Issaquah	WA	98029	4258377036	

Contractor

Company Name

Number Street Apartment or Suite Number

City State Zip Phone Number Extension

State License Number License Expiration Date UBI # E-mail Address

Project Location

Number	Street	Floor Number	Suite or Room Number
565	NW HOLLY ST		

City	Zip Code	County Parcel Number
ISSAQUAH	98027	2824069012

Associated Building Permit Number

Tenant Name: Vacant - No Tenant - Issaquah School District

Additional Information (i.e. equipment location or special instructions).

Work Location

Property Owner

First Name	Last Name or Company Name
*	ISSAQUAH SCHOOL DIST #411

Number	Street	Apartment or Suite Number
5150	220TH AVE SE	

City	State	Zip
ISSAQUAH	WA	98029

Certification Statement - The applicant states:

I certify that I am the owner of this property or the owner's authorized agent. If acting as an authorized agent, I further certify that I have full power and authority to file this application and to perform, on behalf of the owner, all acts required to enable the jurisdiction to process and review such application. I have furnished true and correct information. I will comply with all provisions of law and ordinance governing this type of application. If the scope of work requires a licensed contractor to perform the work, the information will be provided prior to permit issuance.

Date Submitted: 11/3/2021 **Submitted By:** Janelle Walker

CITY OF ISSAQUAH

Land Use Application #1040411 - Holly Street Permanent Creek Bank Repair

Project Contact

Company Name:	Issaquah School District 411		
Name:	Janelle Walker	**Email:**	walkerj2@issaquah.wednet.edu
Address:	5150 220th Avenue SE Issaquah WA 98029	**Phone #:**	4258377036

Project Type	Activity Type	Scope of Work
Any Project Type	Shoreline Development	Shoreline Substantial Development

Project Name: Holly Street Permanent Creek Bank Repair

Description of Work: The permanent stabilization project will consist of installing streambank protection along approximately 130 feet of cutbank on the west side of Issaquah Creek. Protection will include reconstruction of a portion of the bank lost to channel erosion in proximity to Issaquah School District infrastructure with an engineered, non-deformable log toe incorporating large woody debris and habitat boulders. The log toe will provide protection against the erosive forces directed toward the bank, and provide habitat as stream-carried debris is caught and incorporated into the bank. Mechanical anchors are included in the design to add additional security for the large woody debris into the undisturbed streambank and channel, although habitat boulders will anchor the debris for normal and moderately-high flow flood stages of the stream. The woody debris will be situated such that the future possible effects of channel scour are mitigated as much as four feet below the existing channel bottom. As the bioengineered structure decays, revegetation within the reconstructed bank will take hold and form permanent, long-term stabilization. Construction of the stream bank stabilization measures will include work within the ordinary high-water mark of Issaquah Creek. To facilitate work within the stream buffer and reduce impacts associated with construction, fish will be removed from the work area and a temporary coffer dam will be installed along the perimeter of work. See Narrative.

Project Details

Project Information

Use - existing	The current property is used by the Issaquah School District as the Holly Street Campus Early Learning Center, including 1 building, portables and parking lots which are the Issaquah School District's property. Proposed project is for the repair of the creek bank southeast of the building/parking lot. A temporary repair was installed in March of 2021. Permanent repairs will consist of reconstruction of the creekbank with an engineered, non-deformable log toe with woody debris, habitat boulders and mechanical anchors. work will occur within the OHWM, but during the approved fish window of 7/1/22 - 8/30/22. This project will not affect the current property use. See Shoreline Narrative for further description.

Quantity and Size Specifications

Maximum proposed building height	0

Exhibit 2

DECLARATION OF SERVICE OF MAILING

I, BRIAN D. MOSS, state and declare as follows:

That on the 21st day of December, 2021, I deposited in the mail of the United States a sealed envelope containing a public hearing notice, decision or recommendation with postage prepaid addressed to the adjacent property and/or parties of record in the below entitled application or petition:

Notice of Application; STH021-00018 Holly St. Permanent Creek Bank Repair
- Site plan; vicinity map
- mailing Buffer map

I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Signed on the 21st day of December, 2021 at Issaquah, Washington.

BRIAN D. MOSS
Printed Name

Brian D. Moss
Signature

Notice of Application

CITY OF ISSAQUAH WASHINGTON
Community Planning & Development
130 E Sunset Way, P.O. Box 1307
Issaquah, WA 98027
425-837-3100 CPD@issaquahwa.gov

Project Name: Holly Street Permanent Creek Bank Repair

Application: **November 3, 2021**
Application Complete: **November 12, 2021**
Notice of Application: **December 14, 2021**

Notice of Application Public Comment Period:
December 21, 2021 – January 4, 2022
(See Public Comment below for more information)

PROJECT INFORMATION

File Number(s): SHO21-00018

Project Description: The project will install bio-engineered creek bank stabilization along 130 feet of Issaquah Creek. The measures will include large woody debris and habitat structures anchored into the stream bank to provide erosion protection. The stream bank will be revegetated to provide long term stabilization. (See Site Plan)

Project Location: 565 NW Holly Street (See Vicinity Map)

Size of Subject Area in Acres: 19.3 **Sq. Ft.:** 841,186

Applicant: Janelle Walker, Construction Coordinator, Issaquah School District
5150 220th Avenue SE, Issaquah, WA 98029
Phone: 425-837-7036; Email: walkerj2@issaquah.wednet.edu

Decision Maker: Community Planning and Development

Required City Permits: Shoreline Substantial Development, Site Work, Flood Hazard

Required City Permits, Not Part of this Application: Site Work, Flood Hazard

Required Studies: Stream Study, Geo-technical

Existing Environmental Documents Relevant to this Application: SEPA Checklist, Stream Study, Geo-technical

REGULATORY INFORMATION

Zoning: CF-F - Community Facilities - Facilities

Comprehensive Plan Designation: Community Facilities

Consistent with Comprehensive Plan: Yes

Preliminary Determination of the Development Regulations that will be used for Project Mitigation and Consistency: IMC 18.10, Shoreline Master Program, IMC 16.26, IMC 16.36

PUBLIC COMMENT

Key application documents are available at the City's website: issaquahwa.gov/development. Click on the parcel, then select "View Related Documents and Permits" to see the available submittals. The full application is available for review at the Permit Center, City Hall, 130 E Sunset Way 9 am – 1 pm Tuesdays and Thursdays. Please make an appointment with the Project Planner.

Although comments may be accepted up until the final decision is issued, submittal of comments during the Notice of Application Comment Period will ensure comments are considered prior to issuing a decision and will allow staff and/or the applicant to address comments as early in the process as possible.

Written comments are due by 5:00 pm on the Public Comment Period date noted above to:

Community Planning and Development Department
P.O. Box 1307, Issaquah, WA 98027

Or by e-mail to the Project Planner noted below.

To receive further public notices on this project please provide your name, address, and e-mail to the Project Planner and request to become a Party of Record.

Notice, when required, is required to be provided to property owners within 300 feet of the site and to Parties of Record. Please share this notice with others in your neighborhood who may be interested in this project. Property owner, Mortgagee, Lien Holder, Vendor, Seller, etc., please share this notice with tenants and others who may be interested in this project.

PUBLIC MEETING:

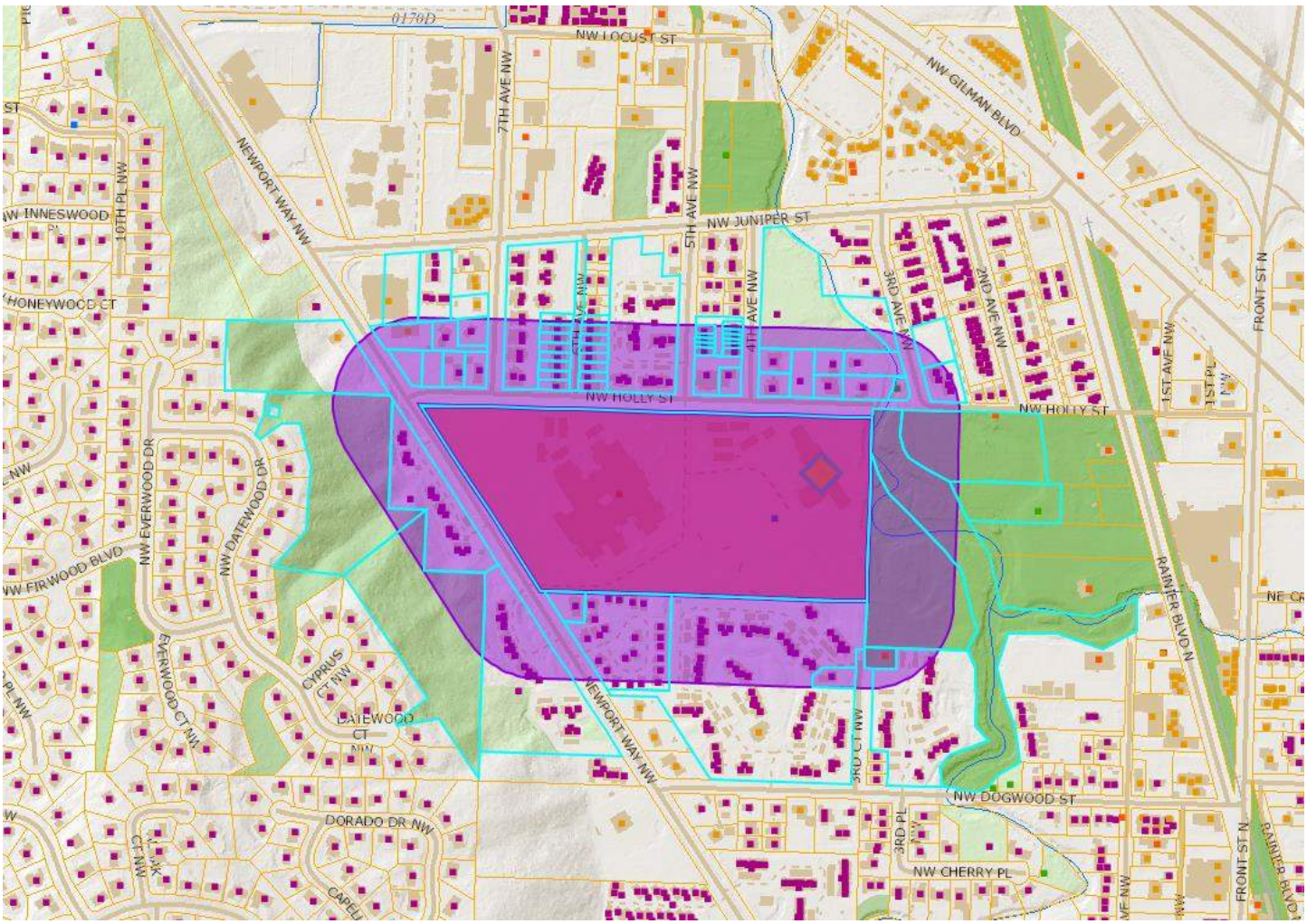
The Community Planning and Development is the decision maker for the SHO21-00018 application. Date and time of the meeting has not been set. A follow up notice will be sent to property owners within 300 feet and to Parties of Record to notify them of the meetings.

CITY CONTACT INFORMATION

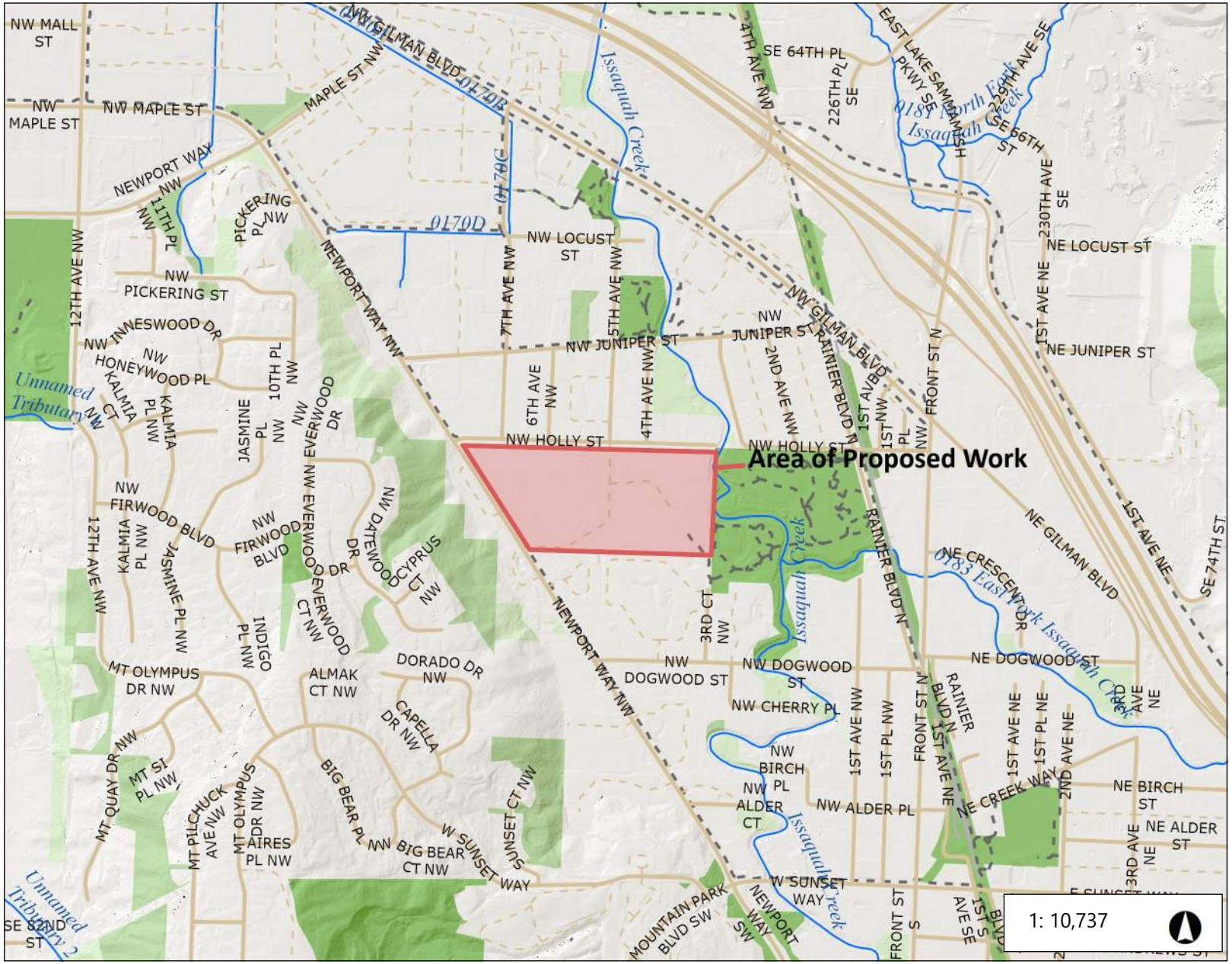
Project Planner: Doug Yormick
Phone Number: 425-837-3083
E-Mail: dougy@issaquahwa.gov

Development Services Department:
Phone Number: 425-837-3100
E-Mail: CPD@issaquahwa.gov

Holly Street Permenant Creek Bank Repair 300-foot Mailing Buffer



Holly Street Permanent Creek Bank Repair Vicinity Map

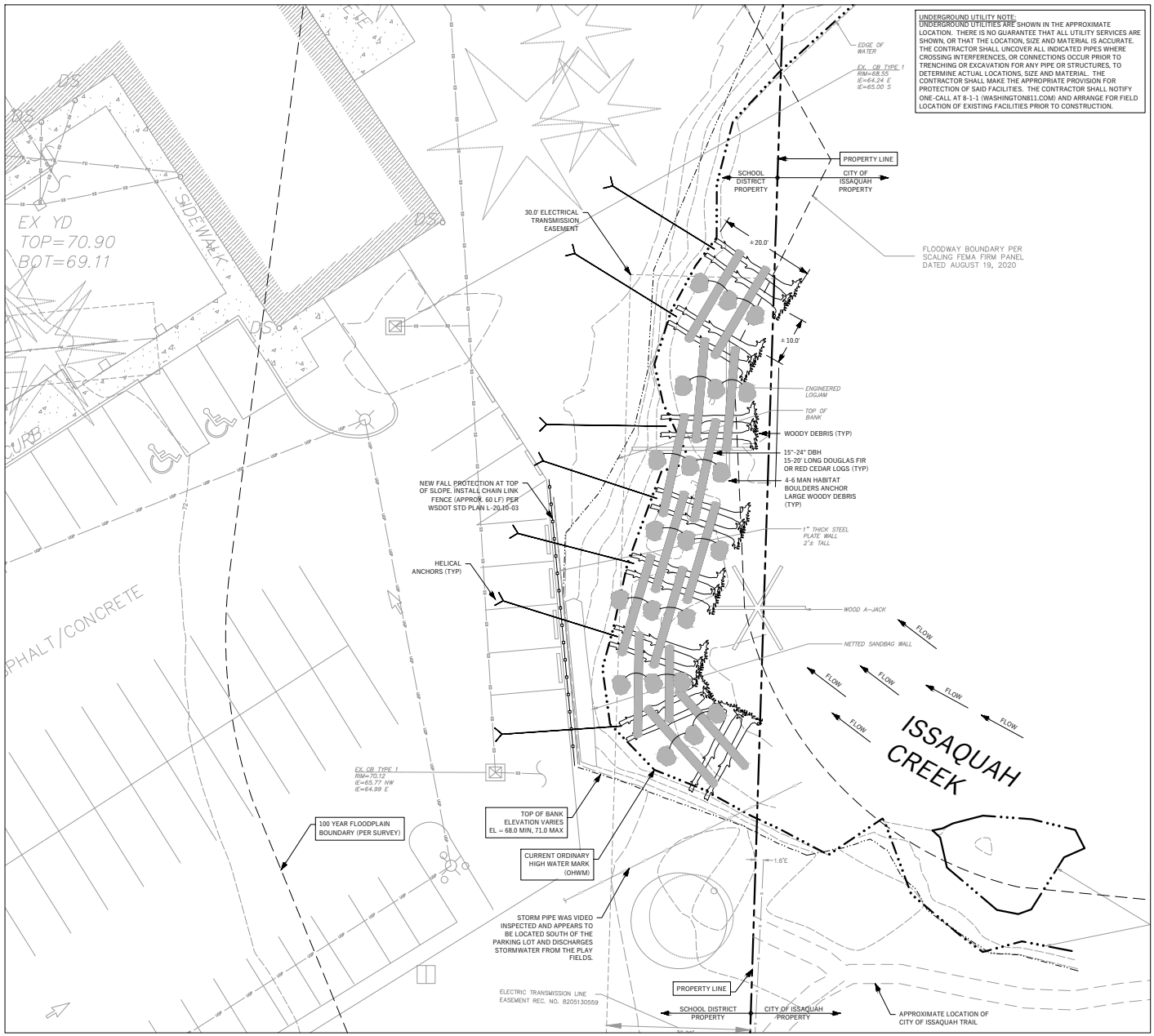


Legend

- Issaquah City Limits
- Streets (Medium scale)
  - STREET
  - HIGHWAY
  - RAMP
  - WALKWAY
  - DRIVEWAY; ACCESS; RETAIL AC
  - PERMANENTLY CLOSED
- Trails
- Railroad
- Water Bodies
- Streams
- Shaded Relief
- Parks - Open Space - NGPE
  - PARK
  - PARK/OPEN SPACE
  - OPEN SPACE
  - NGPE
  - STATE PARK

1,789.6 0 894.78 1,789.6 Feet

SE 1/4, SECTION 28, TOWNSHIP 24N, RANGE 6E, W.M.



Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

0 20 40 Feet

SCALE 1"=10'

LEGEND

PROPERTY LINE

EXISTING CONTOUR 268

THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE. ANY SUCH FACILITIES INSTALLED MUST BE MAINTAINED IN PROPER OPERATING CONDITION UNTIL ALL DISTURBED AREAS HAVE BEEN REVEGETATED OR OTHERWISE DEVELOPED AND THE POTENTIAL FOR EROSION ELIMINATED.

GENERAL TESC NOTES:

1. THE EROSION & SEDIMENT CONTROL (ESC) MEASURES SHOWN ON THIS PLANS ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC MEASURES MUST BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL COVER MEASURES, PUMPING AND CONTAINMENT, RELOCATION OF DITCHES AND SILT FENCES, PERIMETER PROTECTION ETC.)
2. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL THE CONSTRUCTION AND LANDSCAPING IS COMPLETED AND THE POTENTIAL FOR ONSITE EROSION HAS PASSED. THE ESC PLANS ARE TO BE CONSIDERED A DYNAMIC MINIMUM GUIDELINE AND AS SUCH WILL MOST LIKELY HAVE TO BE CONTINUALLY EVALUATED AND/OR MODIFIED DEPENDING ON SITE CONDITIONS.
3. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE DEVELOPER AND ESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
4. STABILIZED CONSTRUCTION ENTRANCES MUST BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS CONSTRUCTED WHEEL WASH SYSTEMS OR WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN AND TRACK OUT TO ROAD RIGHT OF WAY DOES NOT OCCUR FOR THE DURATION OF THE PROJECT.
5. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
6. THE ESC FACILITIES MUST BE INSPECTED DAILY BY THE DEVELOPER/ESC SUPERVISOR AND MAINTAINED TO ENSURE CONTINUED PROPER FUNCTIONING. WRITTEN RECORDS MUST BE KEPT OF WEEKLY REVIEWS OF THE ESC FACILITIES.
7. SOILS MUST NOT REMAIN EXPOSED AND UNWORKED FOR MORE THAN 7 DAYS FROM MAY 1 THROUGH SEPTEMBER 30 AND NOT MORE THAN 48 HOURS FROM OCTOBER 1 AND APRIL 30. EXPOSED AND UNWORKED SOILS MUST BE COVERED BY MULCH, SODDING, PLASTIC COVERING, JUTE-MATTING, OR AS OTHERWISE APPROVED OR REQUIRED BY THE PUBLIC WORKS CONSTRUCTION INSPECTOR.
8. THE ESC FACILITIES ON INACTIVE SITES MUST BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH DURING THE DRY SEASON, BI-MONTHLY DURING THE WET SEASON, OR WITHIN 24 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME MAY MORE THAN 6-INCHES OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES MUST BE CLEANED PRIOR TO PAVING AND FINAL APPROVAL. THE CLEANING OPERATION MAY NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. DUST GENERATED DURING CONSTRUCTION ACTIVITIES MUST BE CONTROLLED BY WETTING DUST SOURCES SUCH AS AREAS OF EXPOSED SOILS, WASHING TRUCK WHEELS BEFORE THEY LEAVE THE SITE, AND INSTALLING AND MAINTAINING ROCK CONSTRUCTION ENTRANCES. CONTRACTOR MUST MECHANICALLY SWEEP STREETS DAILY WITH VACUUM SWEEPER UNLESS OTHERWISE APPROVED.
11. ANY EXCAVATED MATERIAL REMOVED FROM THE CONSTRUCTION SITE AND DEPOSITED ON PROPERTY WITHIN THE CITY LIMITS MUST BE DONE IN COMPLIANCE WITH A VALID CLEARING & GRADING PERMIT. LOCATIONS FOR THE MOBILIZATION AREA AND STOCKPILED MATERIAL MUST BE APPROVED BY THE CLEARING AND GRADING INSPECTOR AT LEAST 24 HOURS IN ADVANCE OF ANY STOCKPILING.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF 2 INCHES.
13. PRIOR TO SEPTEMBER 15, ALL DISTURBED AREAS SHALL BE REVIEWED TO IDENTIFY WHICH ONES CAN BE SEEDED IN PREPARATION FOR THE WINTER RAINS. DISTURBED AREAS SHALL BE SEEDED PRIOR TO OCTOBER 1.
14. REMOVE ALL ESC MEASURES ONCE ALL WORK IS COMPLETED AND SITE IS PERMANENTLY STABILIZED.

TESC AND TURBIDITY MONITORING:

1. DISCHARGE FROM THE PROJECT SITE SHALL NOT EXCEED THE NTU LIMIT AT ALL TIMES UP TO THE 10 YEAR/24 HOUR STORM EVENT. THIS EVENT IS DEFINED AS 3.5 INCHES OF RAINFALL OVER A 24 HOUR PERIOD, AS MEASURED AT THE CITY'S RAIN GAGE. DATA FROM THIS RAIN GAGE IS POSTED ON THE CITY'S WEBSITE. THE DISCHARGE LIMIT TO A NATURAL WATER BODY IS 5 NTU OVER BACKGROUND, OTHERWISE THE LIMIT SHALL BE 100 NTU. EXCEEDANCE OF THE NTU LIMIT IS CONSIDERED A VIOLATION OF THE PERMIT AND IS SUBJECT TO STOP WORK AND CODE VIOLATION PENALTIES.
2. THE CITY OF ISSAQUAH WILL MEASURE THE TURBIDITY OF ANY DISCHARGE AT THE DESIGNATED MONITORING POINTS TO VERIFY COMPLIANCE WITH THE DISCHARGE LIMIT. THE TESC SUPERVISOR SHALL BE NOTIFIED OF DISCHARGES ABOVE 25 NTUS, SO THAT ACTION CAN BE TAKEN TO KEEP DISCHARGES BELOW THESE THRESHOLD LEVELS. FOR PROJECT SITES WHERE DESIGNATING A MONITORING POINT IS NOT FEASIBLE (E.G. FLAT SITES), THE MONITORING LOCATIONS WILL BE AT THE DISCRETION OF THE CITY OF ISSAQUAH.
3. MONITORING POINTS SHALL BE READILY ACCESSIBLE TO THE CITY OF ISSAQUAH AT ALL TIMES FOR ALL PHASES OF CONSTRUCTION.
4. FAILURE TO PROVIDE AND MAINTAIN APPROVED TESC FACILITIES AT CONSTRUCTION SITES IS CONSIDERED A VIOLATION OF THE PERMIT AND IS SUBJECT TO STOP WORK AND CODE VIOLATION PENALTIES.
5. ANY DISCHARGE TO A STREAM, LAKE OR WETLAND SHALL NOT EXCEED WATER QUALITY STANDARDS PER WAC 173-201A. FAILURE TO MEET WAC 173-201A IS CONSIDERED A VIOLATION OF THE PERMIT AND IS SUBJECT TO STOP WORK AND CODE VIOLATION PENALTIES.

KHALED M. SHAWISH — STATE OF WASHINGTON — 35213 — REGISTERED PROFESSIONAL ENGINEER

10/28/2021

ISD HOLLY STREET CAMPUS
PERMANENT CREEK REPAIR

565 NW HOLLY STREET
ISSAQUAH, WA 98027

NO.	REVISION / ISSUE	DATE

OWNER:
ISSAQUAH SCHOOL DISTRICT
5150 220TH AVE SE
ISSAQUAH, WA 98029

CONTACT: JANELLE WALKER
PHONE: 425.306.4022

GEOTECHNICAL ENGINEER:
NELSON GEOTECHNICAL ASSOCIATES
17311 135TH AVE. N.E. SUITE A-500
WOODINVILLE, WA 98072

CONTACT: KHAL M. SHAWISH, PE
PHONE: 425.486.1669

PROJECT: 2020-19	SHEET: C-300
DATE: 2021.10.22	
SCALE: SEE PLAN	

CONSTRUCTION SITE PLAN

SE 1/4, SECTION 28, TOWNSHIP 24N, RANGE 6E, W.M.

Exhibit 3

ISSAQUAH SCHOOL DISTRICT
HOLLY STREET CAMPUS - CREEK BANK REPAIR

CITY OF ISSAQUAH, WA

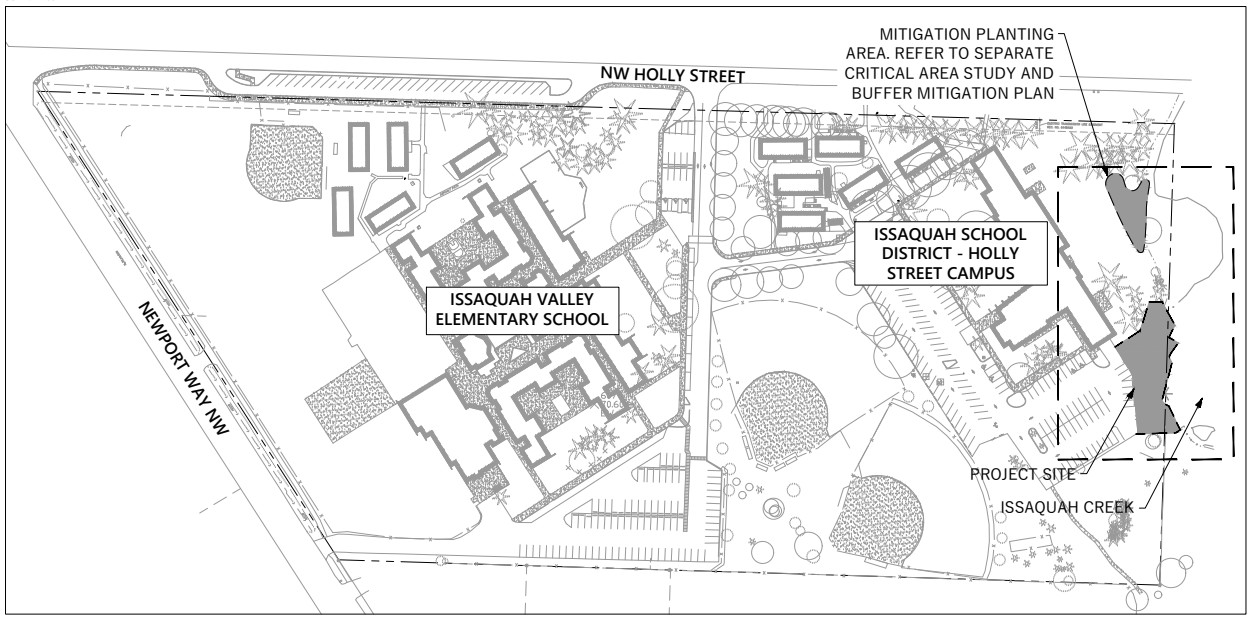
SHORELINE PERMIT

GENERAL NOTES

1. ALL DESIGN AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH PERMIT CONDITIONS, THE ISSAQUAH MUNICIPAL CODE (IMC), THE ISSAQUAH PUBLIC WORKS STANDARDS AND THE CONDITIONS OF APPROVAL. IT SHALL BE THE SOLE RESPONSIBILITY OF THE APPLICANT/CONTRACTOR AND THE PROFESSIONAL CIVIL ENGINEER TO CORRECT ANY ERROR, OMISSION, OR DEVIATION FROM THE ABOVE REQUIREMENTS FOUND IN THESE PLANS. ALL CORRECTIONS SHALL BE AT NO ADDITIONAL COST OR LIABILITY TO THE CITY OF ISSUQUAH.
2. THE DESIGN ELEMENTS WITHIN THESE PLANS HAVE BEEN REVIEWED ACCORDING TO THE CITY OF ISSAQUAH SITE WORK PERMIT SUBMITTAL REVIEW CHECKLIST. ANY DEVIATION FROM ADOPTED STANDARDS IS NOT ALLOWED UNLESS SPECIFICALLY APPROVED BY THE CITY IN WRITING PRIOR TO CONSTRUCTION.
3. APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL OF UTILITIES NOT OWNED BY THE CITY (E.G. DOMESTIC WATER CONVEYANCE, SEWER CONVEYANCE, GAS, ELECTRICAL, ETC.).
4. PRIOR TO ANY CONSTRUCTION OR DEVELOPMENT ACTIVITY, A PRECONSTRUCTION MEETING SHALL BE HELD BETWEEN THE CITY OF ISSAQUAH, THE APPLICANT(S), AND THE APPLICANT'S CONSTRUCTION REPRESENTATIVE.
5. A COPY OF THESE APPROVED PLANS SHALL BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
6. CONSTRUCTION HOURS ARE 7:00 AM TO 6:00 PM MONDAY THROUGH FRIDAY. WORK IS NOT ALLOWED ON SUNDAYS AND SOME HOLIDAYS IN ACCORDANCE WITH THE ISSAQUAH MUNICIPAL CODE. CONSTRUCTION IS NOT ALLOWED ON SATURDAY OR SUNDAY.
7. IT SHALL BE THE APPLICANT'S/CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL NECESSARY CONSTRUCTION EASEMENTS BEFORE INITIATING ANY OFF-SITE WORK.
8. DEWATERING (GROUNDWATER) SYSTEM CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT WSDOT STANDARD SPECIFICATIONS.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW MUST FOLLOW MUTCD. MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) SHALL APPLY. WORK IN RIGHT-OF-WAY IS NOT AUTHORIZED UNTIL A TRAFFIC CONTROL PLAN IS APPROVED BY THE CITY.
10. ANY CHANGES TO THE APPROVED PLANS MAY REQUIRE A REVISION APPROVED BY THE CITY. NO CONSTRUCTION ON THESE CHANGES SHALL BEGIN UNTIL APPROVED BY THE CITY.
11. PER RCW SECTION 19.122, CALL 811 BETWEEN TEN (10) AND TWO (2) BUSINESS DAYS TO ENSURE ANY UNDERGROUND UTILITIES ARE LOCATED PRIOR TO EXCAVATION BEFORE BEGINNING EXCAVATION WHERE ANY UNDERGROUND UTILITIES MAY BE LOCATED. FAILURE TO DO SO COULD MEAN BEARING SUBSTANTIAL REPAIR COSTS.
12. APPROXIMATE LOCATIONS OF EXISTING UTILITIES HAVE BEEN OBTAINED FROM AVAILABLE RECORDS AND ARE SHOWN FOR CONVENIENCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF EXISTING UTILITY LOCATIONS WHETHER OR NOT THESE UTILITIES ARE SHOWN ON THE PLANS. THE CONTRACTOR SHALL EXERCISE ALL CARE TO AVOID DAMAGE TO ANY UTILITY. IF CONFLICTS WITH EXISTING UTILITIES ARISE DURING CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE CITY OF ISSAQUAH SITE INSPECTOR AND ANY CHANGES REQUIRED SHALL BE APPROVED BY THE CITY OF ISSAQUAH SITE INSPECTOR PRIOR TO COMMENCEMENT OF RELATED CONSTRUCTION ON THE PROJECT. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT UTILITY LOCATES ARE MAINTAINED THROUGHOUT THE LIFE OF THE PROJECT.
13. ALL DAMAGES INCURRED TO PUBLIC AND/OR PRIVATE PROPERTY BY THE CONTRACTOR DURING THE COURSE OF CONSTRUCTION SHALL BE PROMPTLY REPAIRED TO THE SATISFACTION OF THE COMMUNITY PLANNING AND DEVELOPMENT CONSTRUCTION INSPECTOR BEFORE PROJECT APPROVAL AND/OR THE RELEASE OF THE PROJECT'S PERFORMANCE BOND.
14. ALL LANDSCAPED AREAS OF THE PROJECT SHALL INCLUDE A MINIMUM OF 8-INCHES OF COMPOSTED SOIL AMENDMENT ATOP A MINIMUM OF 4-INCHES SCARIFIED SOIL. LANDSCAPE AREAS SHALL BE SUBJECT TO AMENDMENTS IN ACCORDANCE WITH THE RESTORATION AND PLANTING PLAN.
15. NO FINAL CUT OR FILL SLOPE SHALL EXCEED SLOPES OF TWO (2) HORIZONTAL TO ONE (1) VERTICAL WITHOUT STABILIZATION BY ROCKERY OR BY A STRUCTURAL RETAINING WALL, UNLESS DESIGNED AND COMPLETED UNDER THE SUPERVISION OF A LICENSED GEOTECHNICAL ENGINEER.
16. THESE PLANS ARE APPROVED FOR STREAM BANK RESTORATION AND STANDARD DRAINAGE IMPROVEMENTS ONLY. STRUCTURES SUCH AS BRIDGES, VAULTS, AND RETAINING WALLS REQUIRE ADDITIONAL PERMITS FROM THE CITY PRIOR TO CONSTRUCTION.
17. NO MATERIALS OR EQUIPMENT SHALL BE PLACED OR STORED ON PUBLIC RIGHT-OF-WAY AT ANY TIME.
18. ANY CONSTRUCTION RESULTING IN A NEED FOR TRAFFIC CONTROL WITHIN THE PUBLIC RIGHT-OF-WAY SHALL REQUIRE A RIGHT-OF-WAY PERMIT APPROVED BY THE CITY.
19. CONSTRUCTION NOISE SHALL BE LIMITED TO THE CONSTRUCTION HOURS AS STATED IN ISSAQUAH MUNICIPAL CODE.

VICINITY MAP

SCALE: 1"=80'



SITE AREA: ±12,400 SF

SHEET INDEX:

SITE DATA SUMMARY:

PARCEL NUMBER: 2824069012

LEGAL DESCRIPTION:

THAT PORTION OF THE FOLLOWING DESCRIBED PROPERTY LYING EAST OF THE NEWPORT-ISSAQUAH ROAD AS CONVEYED TO KING COUNTY BY DEED RECORDED UNDER RECORDING NUMBER 856717:

THE SOUTH HALF OF THE NORTH HALF OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER; ALSO THE SOUTH 58.5 FEET OF THE EAST 336 FEET OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER, ALL IN SECTION 28, TOWNSHIP 24 NORTH, RANGE 6 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY, WASHINGTON;

TOGETHER WITH THE NORTH HALF OF THE NORTH HALF OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER; ALSO THE NORTH 330 FEET OF THE EAST 336 FEET OF THE NORTHEAST QUARTER OF THE SOUTHWEST QUARTER, ALL IN SECTION 28, TOWNSHIP 24 NORTH, RANGE 6 EAST, WILLAMETTE MERIDIAN, IN KING COUNTY WASHINGTON;

EXCEPT THAT PORTION THEREOF AS DEEDED TO KING COUNTY FOR STREET PURPOSES BY DEED RECORDED UNDER RECORDING NUMBER 8008250588.

ADDRESS: 565 NW HOLLY ST, ISSAQUAH, WA 98027

GROSS SITE AREA: 841,186 SF (19.31 ACRES)

APPLICABLE CODE: 2012 STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON, AS AMENDED IN DECEMBER 2014

ZONING: CF-F (COMMUNITY FACILITIES - FACILITIES)

EXISTING PERVIOUS SURFACE: N/A
EXISTING IMPERVIOUS SURFACE: N/A

PROPOSED PERVIOUS SURFACE: N/A
PROPOSED IMPERVIOUS SURFACE: N/A

CUBIC YARDS OF CUT: 450 CY
CUBIC YARDS OF FILL: 780 CY

PROJECT CONTACT INFORMATION:

OWNER

ISSAQUAH SCHOOL DISTRICT
5150 220TH AVE SE
ISSAQUAH, WA 98029

EMAIL: WALKERJ2@ISSAQUAH.WEDNET.EDU
PHONE: 425.306.4022
CONTACT: JANELLE WALKER

SURVEYOR

GROUP FOUR
16030 JUANITA-WOODINVILLE WAY NE
BOTHELL, WA 98011

PHONE: 425.775.4581
CONTACT: DANIEL ROUPE, PLS

CIVIL ENGINEER

LATITUDE 48 ENGINEERS
600 1ST AVENUE
SEATTLE, WA 98104

EMAIL: CHASEN@LATITUDE-48.COM
PHONE: 206.556.1615
CONTACT: CHASEN SIMPSON, PE

WETLAND ECOLOGIST

WETLAND RESOURCES, INC.
9505 19TH AVE SE #106
EVERETT, WA 98208

EMAIL: MERYL@WETLANDRESOURCES.COM
PHONE: 425.337.3174
CONTACT: MERYL KAMOWSKI

GEOTECHNICAL ENGINEER

NELSON GEOTECHNICAL ASSOCIATES, INC.
17311 135TH AVE. N.E. SUITE A-500
WOODINVILLE, WA 98072

EMAIL: KHALS@NELSONGEOTECH.COM
PHONE: 425.486.1669
CONTACT: KHAL M. SHAWISH, PE

KHALED M. SHAWISH — STATE OF WASHINGTON — 35213 — REGISTERED PROFESSIONAL ENGINEER
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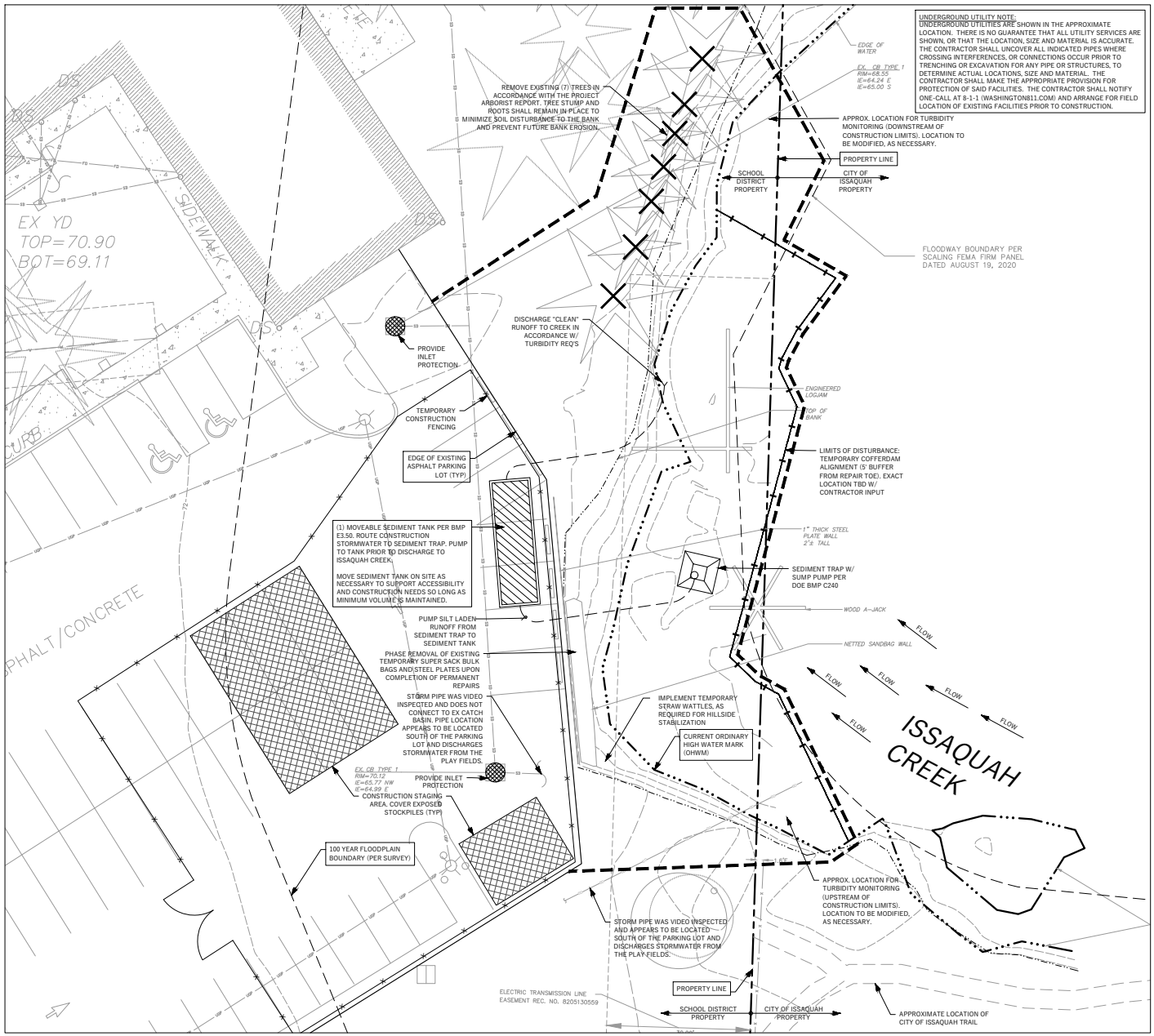
PROJECT: 2020-19	SHEET: C-100
DATE: 2021.10.22	
SCALE: SEE PLAN	

COVER SHEET

SE 1/4, SECTION 28, TOWNSHIP 24N, RANGE 6E, W.M.



Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

0 20 40 Feet

SCALE 1"=10'

LEGEND

PROPERTY LINE

EXISTING CONTOUR 268

LIMITS OF CONSTRUCTION

THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE. ANY SUCH FACILITIES INSTALLED MUST BE MAINTAINED IN PROPER OPERATING CONDITION UNTIL ALL DISTURBED AREAS HAVE BEEN REVEGETATED OR OTHERWISE DEVELOPED AND THE POTENTIAL FOR EROSION ELIMINATED.

GENERAL TESC NOTES:

1. THE EROSION & SEDIMENT CONTROL (ESC) MEASURES SHOWN ON THIS PLANS ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC MEASURES MUST BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL COVER MEASURES, PUMPING AND CONTAINMENT, RELOCATION OF DITCHES AND SILT FENCES, PERIMETER PROTECTION ETC.)
2. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL THE CONSTRUCTION AND LANDSCAPING IS COMPLETED AND THE POTENTIAL FOR ONSITE EROSION HAS PASSED. THE ESC PLANS ARE TO BE CONSIDERED A DYNAMIC MINIMUM GUIDELINE AND AS SUCH WILL MOST LIKELY HAVE TO BE CONTINUALLY EVALUATED AND/OR MODIFIED DEPENDING ON SITE CONDITIONS.
3. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE DEVELOPER AND ESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
4. STABILIZED CONSTRUCTION ENTRANCES MUST BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS CONSTRUCTED WHEEL WASH SYSTEMS OR WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN AND TRACK OUT TO ROAD RIGHT OF WAY DOES NOT OCCUR FOR THE DURATION OF THE PROJECT.
5. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
6. THE ESC FACILITIES MUST BE INSPECTED DAILY BY THE DEVELOPER/ESC SUPERVISOR AND MAINTAINED TO ENSURE CONTINUED PROPER FUNCTIONING. WRITTEN RECORDS MUST BE KEPT OF WEEKLY REVIEWS OF THE ESC FACILITIES.
7. SOILS MUST NOT REMAIN EXPOSED AND UNWORKED FOR MORE THAN 7 DAYS FROM MAY 1 THROUGH SEPTEMBER 30 AND NOT MORE THAN 48 HOURS FROM OCTOBER 1 AND APRIL 30. EXPOSED AND UNWORKED SOILS MUST BE COVERED BY MULCH, SODDING, PLASTIC COVERING, JUTE-MATTING, OR AS OTHERWISE APPROVED OR REQUIRED BY THE PUBLIC WORKS CONSTRUCTION INSPECTOR.
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9. AT NO TIME MAY MORE THAN 6-INCHES OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES MUST BE CLEANED PRIOR TO PAVING AND FINAL APPROVAL. THE CLEANING OPERATION MAY NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. DUST GENERATED DURING CONSTRUCTION ACTIVITIES MUST BE CONTROLLED BY WETTING DUST SOURCES SUCH AS AREAS OF EXPOSED SOILS, WASHING TRUCK WHEELS BEFORE THEY LEAVE THE SITE, AND INSTALLING AND MAINTAINING ROCK CONSTRUCTION ENTRANCES. CONTRACTOR MUST MECHANICALLY SWEEP STREETS DAILY WITH VACUUM SWEEPER UNLESS OTHERWISE APPROVED.
11. ANY EXCAVATED MATERIAL REMOVED FROM THE CONSTRUCTION SITE AND DEPOSITED ON PROPERTY WITHIN THE CITY LIMITS MUST BE DONE IN COMPLIANCE WITH A VALID CLEARING & GRADING PERMIT. LOCATIONS FOR THE MOBILIZATION AREA AND STOCKPILED MATERIAL MUST BE APPROVED BY THE CLEARING AND GRADING INSPECTOR AT LEAST 24 HOURS IN ADVANCE OF ANY STOCKPILING.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF 2-INCHES.
13. PRIOR TO SEPTEMBER 15, ALL DISTURBED AREAS SHALL BE REVIEWED TO IDENTIFY WHICH ONES CAN BE SEEDED IN PREPARATION FOR THE WINTER RAINS. DISTURBED AREAS SHALL BE SEEDED PRIOR TO OCTOBER 1.
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TESC AND TURBIDITY MONITORING:

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KHALED M. SHAWISH — STATE OF WASHINGTON — 35211 — REGISTERED PROFESSIONAL ENGINEER

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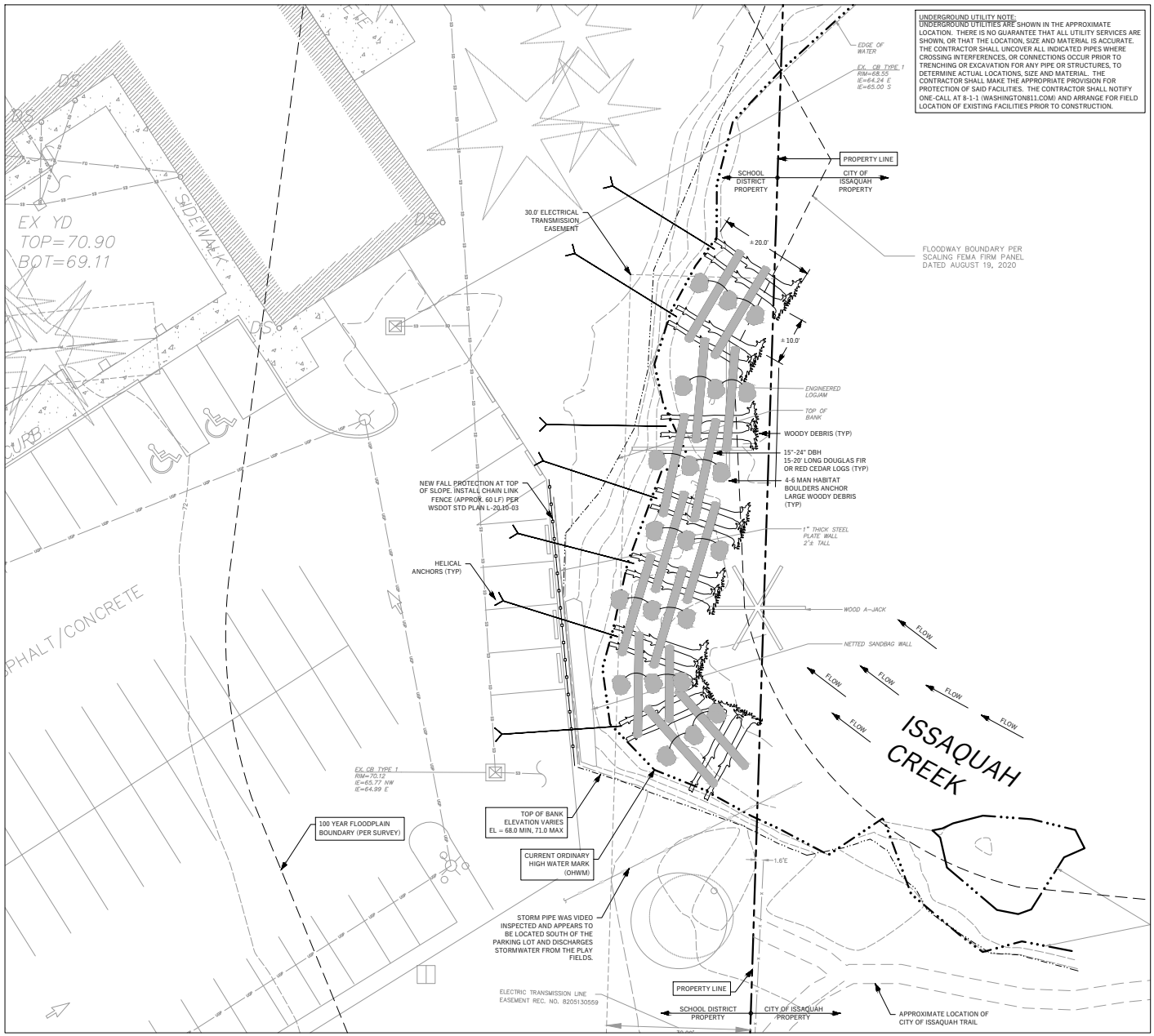
CONTACT: KHAL M. SHAWISH, PE
PHONE: 425.486.1669

PROJECT: 2020-19	SHEET: C-200
DATE: 2021.10.22	
SCALE: SEE PLAN	

TEMPORARY EROSION AND SEDIMENT CONTROL PLAN

SE 1/4, SECTION 28, TOWNSHIP 24N, RANGE 6E, W.M.



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0 20 40 Feet

SCALE 1"=10'

LEGEND

PROPERTY LINE

EXISTING CONTOUR 268

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5. ANY DISCHARGE TO A STREAM, LAKE OR WETLAND SHALL NOT EXCEED WATER QUALITY STANDARDS PER WAC 173-201A. FAILURE TO MEET WAC 173-201A IS CONSIDERED A VIOLATION OF THE PERMIT AND IS SUBJECT TO STOP WORK AND CODE VIOLATION PENALTIES.

KHALED M. SHAWISH — STATE OF WASHINGTON — 35213 — REGISTERED PROFESSIONAL ENGINEER

10/28/2021

ISD HOLLY STREET CAMPUS
PERMANENT CREEK REPAIR

565 NW HOLLY STREET
ISSAQUAH, WA 98027

NO.	REVISION / ISSUE	DATE

OWNER:
ISSAQUAH SCHOOL DISTRICT
5150 220TH AVE SE
ISSAQUAH, WA 98029

CONTACT: JANELLE WALKER
PHONE: 425.306.4022

GEOTECHNICAL ENGINEER:
NELSON GEOTECHNICAL ASSOCIATES
17311 135TH AVE. N.E. SUITE A-500
WOODINVILLE, WA 98072

CONTACT: KHAL M. SHAWISH, PE
PHONE: 425.486.1669

PROJECT: 2020-19	SHEET: C-300
DATE: 2021.10.22	
SCALE: SEE PLAN	

CONSTRUCTION SITE PLAN

DECLARATION OF SERVICE OF MAILING

I, BRIAN D. MOSS, state and declare as follows:

That on the 29th day of MARCH, 2022, I deposited in the mail of the United States a sealed envelope containing a public hearing notice, decision or recommendation with postage prepaid addressed to the adjacent property and/or parties of record in the below entitled application or petition:

Notice of Environmental Neighborhood Meeting PRJ21-00011 / SHO21-00018 - Holly Street Permanent Creek Bank Repair - Vicinity MAP; project Description

I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Signed on the 29th day of MARCH, 2022 at ISSAQUAH, Washington.

BRIAN D. MOSS
Printed Name

Brian D. Moss
Signature

Notice of Environmental Neighborhood Meeting

CITY OF ISSAQUAH WASHINGTON
Community Planning and Development
1775 – 12th Ave. NW | P.O. Box 1307
Issaquah, WA 98027
425-837-3100
Issaquahwa.gov

PROJECT NAME:	**Holly Street Permanent Creek Bank Repair**	**NEIGHBORHOOD MEETING INFORMATION**	
LOCATION:	565 NW Holly Street	**DATE:**	Wednesday, April 6, 2022
NEIGHBORHOOD:	Newport	**TIME:**	6:30 p.m.
FILE NO:	PRJ21-00011/SHO21-00018	**LOCATION:**	Virtual Meeting
			www.issaquahwa.gov/HollyStreetMeeting

ENVIRONMENTAL NEIGHBORHOOD MEETING

The City is hosting a neighborhood meeting to afford the community an opportunity to understand the proposal with particular focus on critical areas, generate discussion, and raise issues before a decision is rendered. City Staff, along with the Applicant's technical area experts, will be in attendance to answer questions and address concerns about the project.

Required Studies to be Discussed: SEPA Checklist, Stream Study

PROJECT INFORMATION

Project Description: The project will install bio-engineered creek bank stabilization along 130 feet of Issaquah Creek. The measures will include large woody debris and habitat structures anchored into the stream bank to provide erosion protection. The stream bank will be revegetated to provide long term stabilization. (See attached Plans)

Location: 565 NW Holly Street (See Vicinity Map)

Required Permits: Shoreline Substantial Development, Site Work, Flood Hazard

Size of Subject Area in Acres: 19.3 **Sq. Ft.:** 841,186

Applicant:
Janelle Walker, Construction Coordinator, Issaquah School District
5150 220th Avenue SE, Issaquah, WA 98029
425-837-7036, walkerj2@issaquah.wednet.edu

PUBLIC MEETING:

- Input from the public will be documented in the permit file and used to finalize the critical area studies for the project. A summary of the meeting will be provided to the Environmental Board for their consideration related to future code changes.
- The decision, once rendered, is appealable.

MEETING SIGN-UP

The day of the meeting, enter the link above and follow these steps:

1. Enter attendee's name
2. Enter attendee's email address
3. Click Join Now

MEETING PACKET AND MATERIALS

A memorandum describing the critical areas of the site which will be discussed at the meeting are available by visiting the following: issaquahwa.gov/EnvironmentalImpact

PUBLIC COMMENT

Written comments are accepted until Wednesday, April 6, 2022 or until the decision is rendered:

Community Planning and Development Department
P.O. Box 1307
Issaquah, WA 98027

Or by e-mail to the Project Planner noted below.

MORE PROJECT INFORMATION

Other key application documents are available at the City's website: issaquahwa.gov/development. Click on the parcel, select "View Related Documents and Permits", and then click on "Related Documents" tab to see the available submittals.

CONTINUED PUBLIC NOTIFICATION

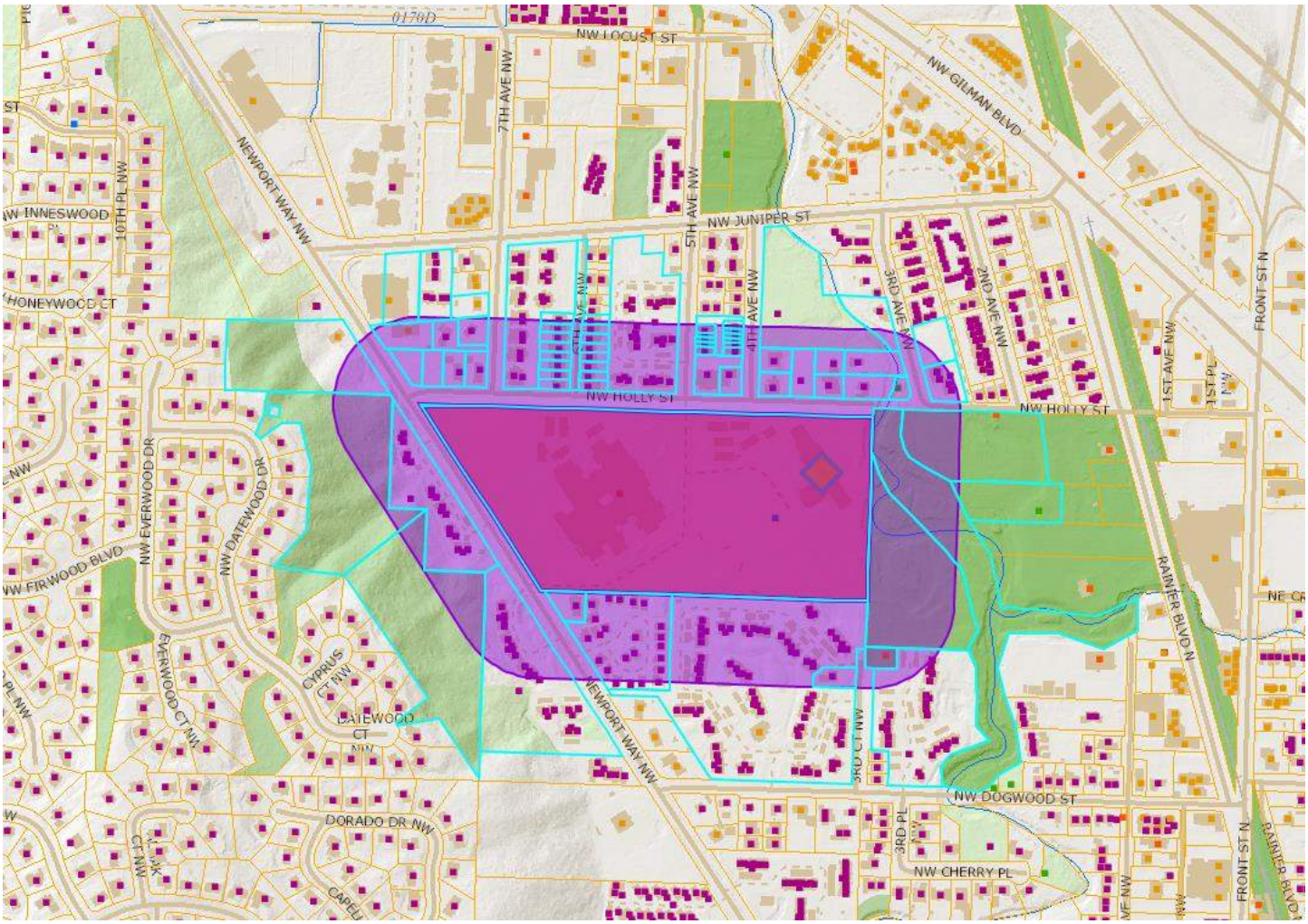
To receive further public notices on this project please provide your name, address, and e-mail to the Project Planner and request to become a Party of Record.

Notice is required to be provided to property owners within 300 feet of the site and to Parties of Record. Please share this notice with others in your neighborhood who may be interested in this project. Property owner, Mortgagee, Lien Holder, Vendor, Seller, etc., please share this notice with tenants and others who may be interested in this project.

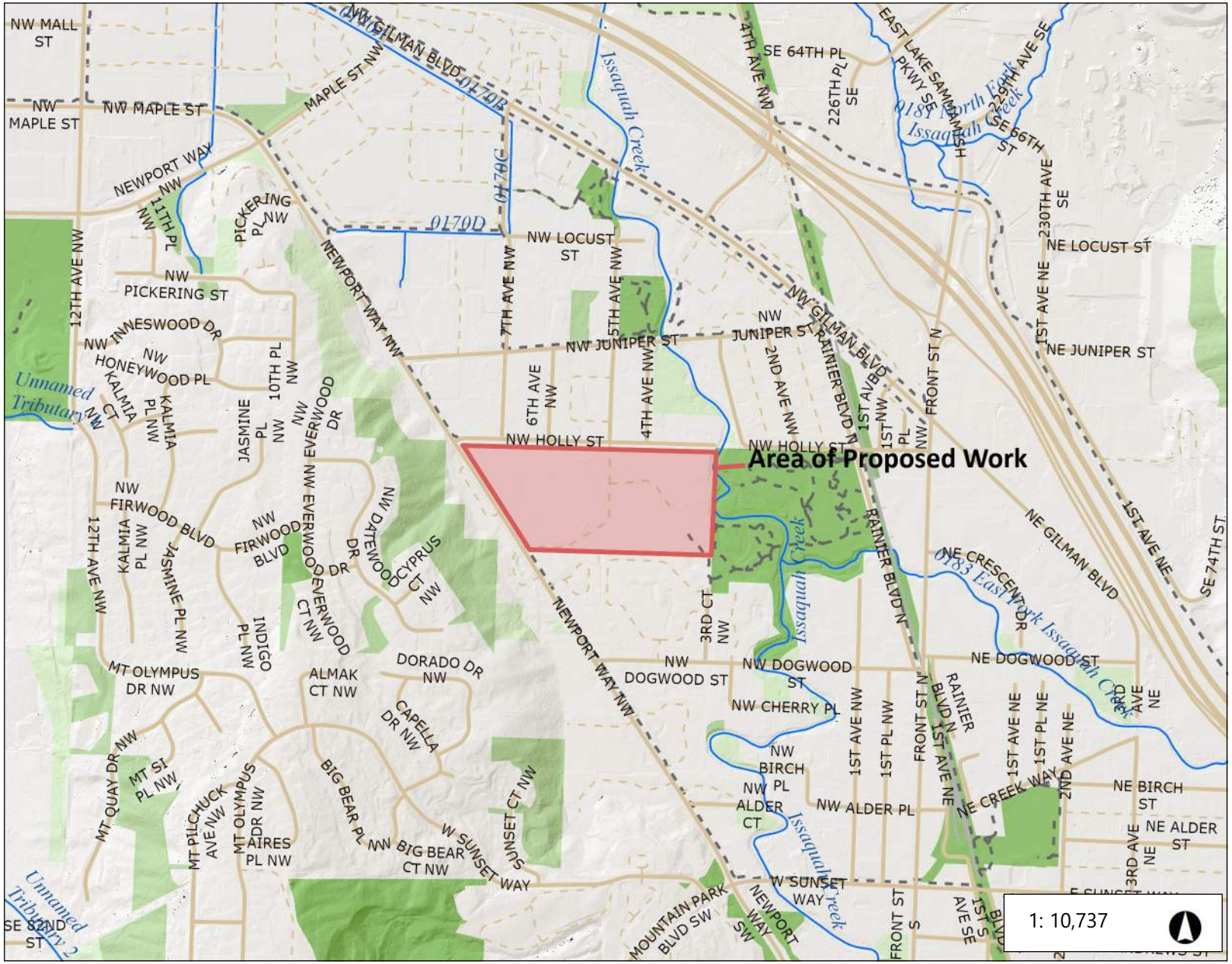
CITY CONTACT INFORMATION

Project Planner:	Doug Yormick, Environmental Planner	**Community Planning and Development Department**:	
Phone Number:	425-837-3083	**Phone Number:**	425-837-3100
E-Mail:	dougy@issaquahwa.gov	**E-Mail:**	CPD@issaquahwa.gov

Holly Street Permenant Creek Bank Repair 300-foot Mailing Buffer



Holly Street Permanent Creek Bank Repair Vicinity Map

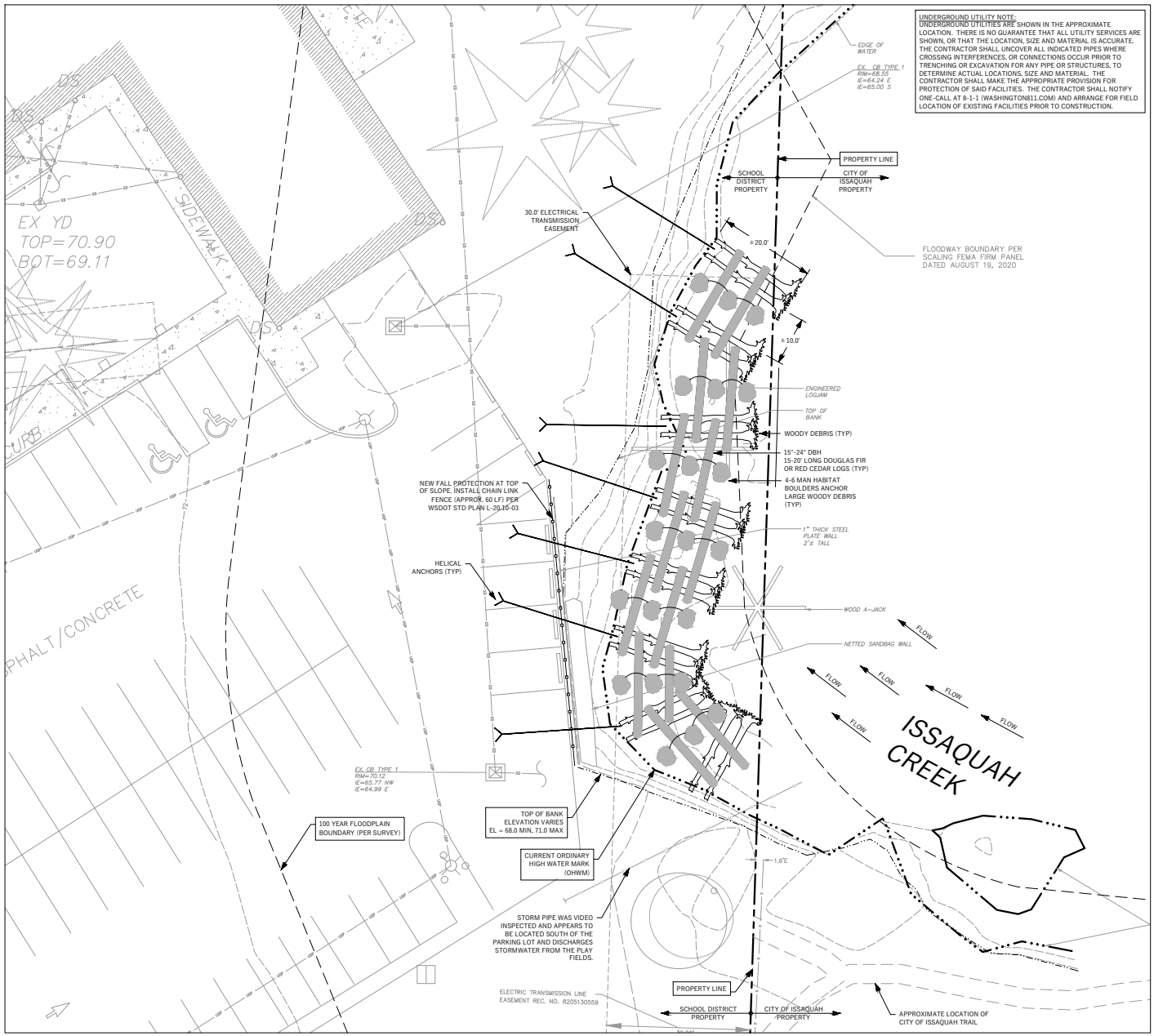


Legend

- Issaquah City Limits
- Streets (Medium scale)
  - STREET
  - HIGHWAY
  - RAMP
  - WALKWAY
  - DRIVEWAY; ACCESS; RETAIL AC
  - PERMANENTLY CLOSED
- Trails
- Railroad
- Water Bodies
- Streams
- Shaded Relief
- Parks - Open Space - NGPE
  - PARK
  - PARK/OPEN SPACE
  - OPEN SPACE
  - NGPE
  - STATE PARK

1,789.6 0 894.78 1,789.6 Feet

SE 1/4, SECTION 28, TOWNSHIP 24N, RANGE 6E, W.M.



Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

0 20 40 Feet

SCALE 1"=10'

LEGEND

PROPERTY LINE

EXISTING CONTOUR 268

THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE. ANY SUCH FACILITIES INSTALLED MUST BE MAINTAINED IN PROPER OPERATING CONDITION UNTIL ALL DISTURBED AREAS HAVE BEEN REVEGETATED OR OTHERWISE DEVELOPED AND THE POTENTIAL FOR EROSION ELIMINATED.

GENERAL TESC NOTES:

1. THE EROSION & SEDIMENT CONTROL (ESC) MEASURES SHOWN ON THIS PLANS ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC MEASURES MUST BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL COVER MEASURES, PUMPING AND CONTAINMENT, RELOCATION OF DITCHES AND SILT FENCES, PERIMETER PROTECTION ETC.)
2. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL THE CONSTRUCTION AND LANDSCAPING IS COMPLETED AND THE POTENTIAL FOR ONSITE EROSION HAS PASSED. THE ESC PLANS ARE TO BE CONSIDERED A DYNAMIC MINIMUM GUIDELINE AND AS SUCH WILL MOST LIKELY HAVE TO BE CONTINUALLY EVALUATED AND/OR MODIFIED DEPENDING ON SITE CONDITIONS.
3. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE DEVELOPER AND ESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
4. STABILIZED CONSTRUCTION ENTRANCES MUST BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS CONSTRUCTED WHEEL WASH SYSTEMS OR WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN AND TRACK OUT TO ROAD RIGHT OF WAY DOES NOT OCCUR FOR THE DURATION OF THE PROJECT.
5. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
6. THE ESC FACILITIES MUST BE INSPECTED DAILY BY THE DEVELOPER/ESC SUPERVISOR AND MAINTAINED TO ENSURE CONTINUED PROPER FUNCTIONING. WRITTEN RECORDS MUST BE KEPT OF WEEKLY REVIEWS OF THE ESC FACILITIES.
7. SOILS MUST NOT REMAIN EXPOSED AND UNWORKED FOR MORE THAN 7 DAYS FROM MAY 1 THROUGH SEPTEMBER 30 AND NOT MORE THAN 48 HOURS FROM OCTOBER 1 AND APRIL 30. EXPOSED AND UNWORKED SOILS MUST BE COVERED BY MULCH, SODDING, PLASTIC COVERING, JUTE-MATTING, OR AS OTHERWISE APPROVED OR REQUIRED BY THE PUBLIC WORKS CONSTRUCTION INSPECTOR.
8. THE ESC FACILITIES ON INACTIVE SITES MUST BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH DURING THE DRY SEASON, BI-MONTHLY DURING THE WET SEASON, OR WITHIN 24 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME MAY MORE THAN 6-INCHES OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES MUST BE CLEANED PRIOR TO PAVING AND FINAL APPROVAL. THE CLEANING OPERATION MAY NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. DUST GENERATED DURING CONSTRUCTION ACTIVITIES MUST BE CONTROLLED BY WETTING DUST SOURCES SUCH AS AREAS OF EXPOSED SOILS, WASHING TRUCK WHEELS BEFORE THEY LEAVE THE SITE, AND INSTALLING AND MAINTAINING ROCK CONSTRUCTION ENTRANCES. CONTRACTOR MUST MECHANICALLY SWEEP STREETS DAILY WITH VACUUM SWEEPER UNLESS OTHERWISE APPROVED.
11. ANY EXCAVATED MATERIAL REMOVED FROM THE CONSTRUCTION SITE AND DEPOSITED ON PROPERTY WITHIN THE CITY LIMITS MUST BE DONE IN COMPLIANCE WITH A VALID CLEARING & GRADING PERMIT. LOCATIONS FOR THE MOBILIZATION AREA AND STOCKPILED MATERIAL MUST BE APPROVED BY THE CLEARING AND GRADING INSPECTOR AT LEAST 24 HOURS IN ADVANCE OF ANY STOCKPILING.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF 2 INCHES.
13. PRIOR TO SEPTEMBER 15, ALL DISTURBED AREAS SHALL BE REVIEWED TO IDENTIFY WHICH ONES CAN BE SEEDED IN PREPARATION FOR THE WINTER RAINS. DISTURBED AREAS SHALL BE SEEDED PRIOR TO OCTOBER 1.
14. REMOVE ALL ESC MEASURES ONCE ALL WORK IS COMPLETED AND SITE IS PERMANENTLY STABILIZED.

TESC AND TURBIDITY MONITORING:

1. DISCHARGE FROM THE PROJECT SITE SHALL NOT EXCEED THE NTU LIMIT AT ALL TIMES UP TO THE 10 YEAR/24 HOUR STORM EVENT. THIS EVENT IS DEFINED AS 3.5 INCHES OF RAINFALL OVER A 24 HOUR PERIOD, AS MEASURED AT THE CITY'S RAIN GAGE. DATA FROM THIS RAIN GAGE IS POSTED ON THE CITY'S WEBSITE. THE DISCHARGE LIMIT TO A NATURAL WATER BODY IS 5 NTU OVER BACKGROUND, OTHERWISE THE LIMIT SHALL BE 100 NTU. EXCEEDANCE OF THE NTU LIMIT IS CONSIDERED A VIOLATION OF THE PERMIT AND IS SUBJECT TO STOP WORK AND CODE VIOLATION PENALTIES.
2. THE CITY OF ISSAQUAH WILL MEASURE THE TURBIDITY OF ANY DISCHARGE AT THE DESIGNATED MONITORING POINTS TO VERIFY COMPLIANCE WITH THE DISCHARGE LIMIT. THE TESC SUPERVISOR SHALL BE NOTIFIED OF DISCHARGES ABOVE 25 NTUS, SO THAT ACTION CAN BE TAKEN TO KEEP DISCHARGES BELOW THESE THRESHOLD LEVELS. FOR PROJECT SITES WHERE DESIGNATING A MONITORING POINT IS NOT FEASIBLE (E.G. FLAT SITES), THE MONITORING LOCATIONS WILL BE AT THE DISCRETION OF THE CITY OF ISSAQUAH.
3. MONITORING POINTS SHALL BE READILY ACCESSIBLE TO THE CITY OF ISSAQUAH AT ALL TIMES FOR ALL PHASES OF CONSTRUCTION.
4. FAILURE TO PROVIDE AND MAINTAIN APPROVED TESC FACILITIES AT CONSTRUCTION SITES IS CONSIDERED A VIOLATION OF THE PERMIT AND IS SUBJECT TO STOP WORK AND CODE VIOLATION PENALTIES.
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KHALED M. SHAWISH — STATE OF WASHINGTON — 35213 — REGISTERED PROFESSIONAL ENGINEER

10/28/2021

ISD HOLLY STREET CAMPUS
PERMANENT CREEK REPAIR

565 NW HOLLY STREET
ISSAQUAH, WA 98027

NO.	REVISION / ISSUE	DATE

OWNER:
ISSAQUAH SCHOOL DISTRICT
5150 220TH AVE SE
ISSAQUAH, WA 98029

CONTACT: JANELLE WALKER
PHONE: 425.306.4022

GEOTECHNICAL ENGINEER:
NELSON GEOTECHNICAL ASSOCIATES
17311 135TH AVE. N.E. SUITE A-500
WOODINVILLE, WA 98072

CONTACT: KHAL M. SHAWISH, PE
PHONE: 425.486.1669

PROJECT: 2020-19	SHEET: C-300
DATE: 2021.10.22	
SCALE: SEE PLAN	

CONSTRUCTION SITE PLAN

Exhibit 5

NELSON GEOTECHNICAL
ASSOCIATES, INC.

17311-135th Ave. N.E. Suite A-500
Woodinville, WA 98072
(425) 486-1669
www.nelsongeotech.com

October 28, 2021

Issaquah School District No. 411
ATTN: Janelle Walker, Capital Projects
5150 – 220th Avenue SE
Issaquah, WA 98029
VIA Email: **walkerj2@issaquah.wednet.edu**

Geotechnical and Engineering Geologic Hazard Evaluation - *REVISED*
ISD Holly Street Campus - Permanent Streambank Stabilization
565 NW Holly Street
Issaquah, Washington
NGA File No. 1228720

We are pleased to submit the attached report titled "**Geotechnical and Engineering Geologic Hazard Evaluation – ISD Holly Street Campus - Permanent Streambank Stabilization – 565 NW Holly Street – Issaquah, Washington**." This report summarizes our observations of the existing surface and subsurface conditions within the site, qualifies the geologic hazard presented by Issaquah Creek, and provides recommendations for the design of Streambank Stabilization Methods in relation to the geologically critical areas within proximity of the site. Our services were completed in general accordance with the proposal authorized by Issaquah School District No. 411 on December 4, 2020.

The subject site is situated on the southeastern portion of the School District property at the above address. The eastern portion of the property is occupied by Issaquah Creek, which flows in narrow meander bends to the north in the vicinity of the site. The study area comprises a tenth-of-a-mile reach centered at approximately River Mile 2.85 along Issaquah Creek. The creek channel bottom has an average, approximate elevation of 60 feet above Mean Sea Level (MSL) within proximity of the property, and the upland areas in the southwestern portion of the site have an elevation around 70 feet MSL.

The site has experienced significant erosion associated with Issaquah Creek, and infrastructure has been undercut by the stream after flooding occurred in the 2019-2020 wet season. The site is subject to critical areas mapped by the City of Issaquah. The City and other jurisdictional agencies have requested that an analysis and evaluation of the potential of channel migration within this portion of Issaquah Creek near the site be performed prior to issuance of various permits needed for long-term stabilization. The scope of our work includes an evaluation of the reach of the stream in the vicinity of the affected property in accordance with Section 2 of the Forest Practices Board Manual (Title 222 WAC), Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones (2004).

The evaluation of the channel migration hazards associated with Issaquah Creek was completed to inform stabilization considerations. We reviewed historic imagery and performed site walk-through evaluations to provide the necessary background data to render our opinions regarding future risks based on the prevailing data and conditions. The project is currently in the preliminary process of plan development, and we understand project plans are iteratively being developed at the time this report was prepared.

We have concluded that a combined bioengineered and structural solution can stabilize the site long-term from the effects of erosion associated with flooding on Issaquah Creek, from a geotechnical and engineering geologic standpoint. Various constraints on the project scope, particularly including the limited area between infrastructure and the original Ordinary High-Water Mark, have narrowed possible methods for long-term stabilization. Stakeholder and jurisdictional preferences and requirements were also considered during the evaluation of stabilization alternatives.

The scope of our services for this project are limited to analysis of channel migration hazards and stabilization with bioengineered methods. Other geologic or environmentally hazardous areas may be present within or in proximity to the site. Our report is meant to be interpreted in conjunction with a biological assessment to address other environmental factors in bioengineered stabilization of the affected stream bank. In the attached report, we have only provided general recommendations for foundations, site grading, erosion control, and drainage, as they pertain to the erosion hazard areas and channel migration hazards within the property and immediate vicinity. We should be retained to review and comment on final stabilization plans prior to construction.

It has been a pleasure to provide service to you on this project. Please contact us if you have any questions regarding this report or require further information.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Khaled M. Shawish, PE
Principal

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Geotechnical and Engineering Geologic Hazard Evaluation - *REVISED*
ISD Holly Street Campus – Permanent Streambank Stabilization
565 NW Holly Street
Issaquah, Washington

INTRODUCTION

This report presents the results of our geotechnical and engineering geologic investigation of the local stream channel migration hazards and subsequent recommendations for bank stabilization for Issaquah Creek in proximity to the Issaquah School District Holly Street Campus property located at 565 NW Holly Street in Issaquah, Washington. The location of the site is shown on the Vicinity Map in Figure 1. Issaquah Creek flows westward and northward directly east of the property, and flooding in 2019-2020 resulted in substantial erosion to streambanks in the vicinity of the site. Specifically, rapid undermining of parking pavement and now-abandoned utility conduit was experienced on the easternmost portion of the subject site. Project stakeholders pursued temporary streambank stabilization measures consisting of driven steel piles spanned by subsurface metal sheets to prevent further damage to the structures on the property while permanent stabilization methods are designed and permitted.

Streams and other fluvial systems are dynamic and frequently change in response to environmental and anthropogenic (human-caused) forces. Channel migration zones (CMZ) describe areas in proximity to existing stream channels that contain a high risk of occupation by the channel within the next century. The purpose of this study is to delineate the channel migration zone within the study area to determine erosion hazards, then to evaluate integrated streambank stabilization approaches to best mitigate recent erosion and improve bank habitat and resiliency. The basis of evaluation has been conducted in accordance with the provisions of Issaquah Municipal Code (IMC) Section 16.36 and 2013 Shoreline Master Program Section 7.1.3, which outline New Shoreline Stabilization guidelines on Issaquah Creek. A glossary of technical terms used in this study is presented in **Appendix A** for clarity. Since the City of Issaquah does not explicitly regulate technical guidance to be used in geotechnical analyses of stabilization methods, we have evaluated the necessity of stabilization in accordance with elements of Section 2 of the Washington State Forest Practices Board Manual (Title 222 WAC), Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones (2004). Stabilization alternatives and approaches were evaluated in accordance with the Washington State Department of Fish and Wildlife (WDFW) - Aquatic Habitat Guidelines Program's Integrated Streambank Protection Guidelines manual (Cramer, 2003).

The study area comprises a tenth-of-a-mile reach centered at approximately River Mile 2.85 along Issaquah Creek. The location of the site is presented in the Vicinity Map in Figure 1. The creek channel bottom has an average, approximate elevation of 60 feet above Mean Sea Level (MSL) within proximity of the property, and the upland areas in the southwestern portion of the site have an elevation around 70 feet MSL. The existing site layout and approximate topography is shown on the Site Plan in Figure 2.

SCOPE

The purpose of this study is to explore and characterize the site surface conditions, delineate the erosion hazards associated with the channel migration zone within the study area, and to analyze approaches for bank stabilization, where necessary. Specifically, our scope of services included the following:

1. A review of available soil and geologic maps of the area, as well as relevant geotechnical engineering documentation pertaining to the site and surroundings, as provided.
2. Visiting the site to observe current surface conditions, including areas immediately upstream and downstream of the subject property comprising the affected stream reach.
3. Obtaining and reviewing available topographic surveys, aerial and LiDAR imagery of the area to evaluate historic channel conditions.
4. Reviewing historic flooding conditions on nearby stream gauges.
5. Providing an estimate of historic riverbank recession in proximity of the property.
6. Providing our opinions relative to historic, existing, and future potential channel migration within the vicinity of the subject property.
7. Evaluating streambank stabilization approaches and alternatives in accordance with the City of Issaquah's Shoreline Master Program and WDFW Integrated Streambank Protection Guidelines.
8. Documenting the results of our findings, conclusions, and recommendations in a written engineering geologic and geotechnical report.

SITE CONDITIONS

The site is occupied by an Issaquah School District administration building surrounded by vehicle parking and access on the southern and western sides of the structure. The structure was constructed in 1969, and parking areas in proximity to Issaquah Creek's current alignment within the site are composed of concrete. The southeast corner of the structure is set back approximately 57 feet from the Ordinary High Water Mark (OHWM) of Issaquah Creek, while the parking lot on the southeastern portion of the property is within 9 feet of the OHWM and was undercut by repeated flooding first in the wet season of 2019-2020 and again as late as March of this year.

The facilities operated by Issaquah School District occupy a relatively level, valley-fill terrace above Issaquah Creek. The terrace comprises alluvial fill deposited post-glaciation by Issaquah Creek. In the vicinity of the subject site, Issaquah Creek has a moderate, meandering morphology, but has historically been modified to serve agriculture and development in the region. A LiDAR map of the vicinity of the subject site is presented in Figure 3 for regional geomorphic context.

Within the study segment, as the current channel flows westward in proximity to the site, it dramatically shifts northward, with the turning point located immediately adjacent to the affected parking lot. The site is situated along the outside edge of a 'cut bank' downstream of the confluence with the east Fork Issaquah Creek. Downstream on the same side of the stream, Issaquah Creek meanders in the opposite direction and a 'point bar' continues to form and collect sediment. The creek generally occupies a single channel with a maximum bankfull depth of 6.3 feet, as shown on Cross Sections in Figures 4 through 7. The channel depth varies, and of particular note the channel experiences a small knickpoint immediately upstream of the subject site where embedded logs and debris have enabled drop scour on the order of a couple of feet. Based on a review of stream gauge flow data, the flow volume in Issaquah Creek is most strongly tied to seasonal rainfall.

The 0.1-mile reach centered on River Mile (RM) 2.85 is characterized by steeply sloping eastern banks with actively eroding alluvial sands and gravels exposed at the cutbank. The western bank is a gently- to moderately sloping gravel point bar, with vegetation near elevations in the vicinity of 68 feet MSL. Clasts within the creek are consistently fine to coarse gravel in size, coarsening in proximity to the thalweg. Large woody debris installed at the edge of the previous edge of the cutbank alignment now occupy upper- to mid-channel slopes within the stream in front of the property in the critical portion of the study segment. The fluctuation in river stage and measured flow during flooding periods suggests that much of the material eroded from banks is transported short to moderate distances downstream of the study area, and bedload transportation qualitative measures have a limited capability of estimation within the scope of this study. Several logs and debris accumulation were observed on the cutbank in this reach.

Current Conditions Survey: We visited the property to conduct a current conditions survey on July 1, 2021. We documented channel characteristics and geomorphology near RM 2.85. During our site visit, the discharge officially measured at RM 1.2 from the United States Geological Survey (USGS) Stream Flow Station 12121600, Issaquah Creek Near Mouth near Issaquah, WA (SE 56th Street) was 33.6 cubic feet per second (cfs) corresponding to a river stage of 4.21. Informal measurement at the site during our visit corresponded to a discharge of about 47.45 cfs. For reference, in the past year this stream gauge has measured a range of stages between 3.89 and 14.57, with flows ranging between about 9 and 3,580 cfs.

Conditions of the stream banks and exposed soil stratigraphy of eroding banks and modes of bank failure were noted during our site visit. Subsurface conditions were not explored directly, but photographs of eroding banks and aggradational features were documented to provide a qualitative record of grain size distributions.

Channel morphology was documented in four locations, as shown on Cross Sections in Figures 4 through 7. In general, cross sections show the incision of a 'scour pool' landward (west-southwest) of the original OHWM, progressively deepening downstream along the affected cutbank alignment.

Interpreted Subsurface Conditions

Geology: The geologic units for this area are shown in the Geologic Map of the East Half of the Bellevue South 7.5' x 15' Quadrangle, Issaquah Area, King County, Washington, by Derek B. Booth, Walsh, T.J., Troost, K.G., and Shimel, S.A. (USGS, 2012). The regional valley occupied by Issaquah Creek is mapped with a recent mantle of surficial alluvium (river) deposits, and discrete exposures of sedimentary exposures of pre-Fraser glaciation age in upland areas on either side of the regional valley walls, which likely underly the alluvial sediments at depth within the stream channel. We utilized explorations by Associated Earth Sciences, Inc. (AESI) prepared previously for a project on this site to verify subsurface materials. Logs of those explorations are presented in **Appendix B**.

Soils: The Soil Survey of King County Area, Washington, by the Natural Resources Conservation Service (NRCS), classifies the soils in proximity to the site on the southern bank of the River as Briscot silt loam. The material is derived from alluvium and is predominantly located on flood plains.

Site Observations and Exposure Mapping

During our site visit on July 1, 2021, we documented the presence of alluvial materials at the ground surface and in exposures along banks and slopes within the site and nearby vicinity. Bedrock or glacial soil outcrops were not encountered at the site. The cutbank within the site displayed predominantly gravelly, and sandy materials where unobscured by invasive groundcover plants. Elsewhere, banks primarily exposed moderately vegetated sands and gravels generally consistent with previous mapping of alluvium.

Bankfull conditions were determined in accordance with Section 2 of the Forest Practices Board Manual (Title 222 WAC), Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones (2004). Specifically, bankfull conditions are the average channel dimensions needed to completely fill the channel to a point at which flooding occurs on terraces or at hillslopes. Measured cross sections across Issaquah Creek are presented as Figures 4 through 7 and indicate these interpreted conditions.

Sedimentology: Sediment has historically been supplied by Issaquah Creek to the study area and beyond by landslides and incision along the steep, upper valley tributaries in the Tradition Plateau and Issaquah Alps highland areas. Sedimentary rocks and upland glacial fill gravel sediments within the stream are derived from erosion in the highlands to the south and east of Issaquah. Abundant local sediment sources exist in proximity to the subject stream reaches, and are being actively eroded during peak flow events, mobilizing cobble, gravel, and sand material from older alluvial valley fill.

Hydrogeologic Conditions

The capacity for Issaquah Creek to avulse from its channel has been strongly affected by urbanization and development in Issaquah; however, migration and erosion most frequently occurs during periods of flooding, where peak flow provides the stream with enough energy to erode banks and transport oversize gravels and cobbles. Flow levels downstream of major confluences on Issaquah Creek have been continuously monitored by the USGS at RM 1.2 with Stream Flow Station 12121600, Issaquah Creek Near Mouth near Issaquah, WA (SE 56th Street) since October 10, 1986, although water data back to 1945 are available from this station. The basin area for the gauge is approximately 56.6 square miles. Flooding on Issaquah Creek is officially recognized when the stage is higher than 7.5 feet on an upstream gauge near Hobart, generally and informally corresponding to a measurement of 9.5 feet on this gauge. Data from the stream gauge were reviewed for peak flow conditions, although precise flood recurrence intervals were not computed based on project scope limitations. Furthermore, historical flow events cannot be used as a precise prediction of future conditions due to changing land use and local climatic impacts. Significant flow events organized by date are indicated in Table 1 below.

Table 1 – Selected Historical Peak Flow Events on Issaquah Creek in Issaquah, WA

Date	Gauge Stage (ft)	Stream Flow (cfs)	Date	Gauge Stage (ft)	Stream Flow (cfs)
01/09/1990	13.5	3,200	11/26/1998	11.18	1,870
11/24/1990	13.43	2,410	01/01/1997	11.16	1,830
11/24/1986	13.2	3,100	12/03/2007	11.15	1,970
02/08/1996	12.84	2,420	02/19/1995	10.8	1,740
01/08/2009	12.56	2,450	12/15/1979	10.7	1,940
02/06/2020	12.33	2,620	01/24/1982	10.64	1,920
01/25/1984	11.79	2,330	12/12/2010	10.64	2,060
01/19/1986	11.52	2,300	01/29/2004	10.48	1,750
11/14/2001	11.5	2,080	02/28/1972	10.23	2,260
11/06/2006	11.5	2,080	02/09/2017	9.71	1,510
12/03/1975	11.46	2,870	01/11/2006	9.68	1,500
12/09/2015	11.41	2,000	12/11/2004	9.53	1,460
01/05/1983	11.18	2,110	04/05/1989	9.51	1,330

Woody debris can affect channel migration by diverting flow away from sensitive banks or focusing erosive energy and directing flow if a log jam blocks the active channel. This process can also contribute to avulsion hazards. Wood can be moved downstream or deposited and stored within the channel. During historical aerial review and our site visit, we noted the presence of only individual large logs, sporadically distributed and periodically moved. These logs present only localized influence on channel morphology and are typically located along banks.

Historical Conditions

Aerial Review: Historical channels and locations were determined from available aerial imagery and topographic maps listed in Table 2. Due to mapping discrepancies, the available topographic maps which include the site only provide a general sense of the map-scale channel form and lacks high enough scale to determine the Historic Migration Zone (HMZ) by tracking the lateral position of the channel. Aerial photographs also do not provide best channel position data due to the historically highly vegetated channel being obscured. Rough channel form was determined by aerial imagery review, which suggested avulsion events likely occurring during flooding in 1986 shifting the alignment toward an easterly channel, then again in 1990, shifting the alignment westerly and meandering toward the school district structures. The channel has occupied the same form in the vicinity of the site since approximately 1990 and appears to have been progressively eroding the cutbank since that time.

Table 2 – Historical Aerial Imagery used to Delineate Channel Positions

Date	Type	Source
1936	Aerial Photograph	King County
1964	Aerial Photograph	USGS
1968	Aerial Photograph	USGS
1969	Aerial Photograph	USGS
1980	Aerial Photograph	USGS
1981	Aerial Photograph	USGS
1990	Aerial Photograph	USGS
1998	Aerial Photograph	King County
2000	Aerial Photograph	King County
2002	Aerial Photograph	King County
2003	LiDAR Imagery	WADNR
2005	Aerial Photograph	King County
2005	LiDAR Imagery	Terrapoint
2009	Aerial Photograph	King County
2012	Aerial Photograph	King County
2013	Aerial Photograph	King County
2015	Aerial Photograph	King County
2016	LiDAR Imagery	Quantum Spatial
2017	Aerial Photograph	King County
2019	Aerial Photograph	King County

Regional geomorphic features which may be imperceptible at ground level can be inferred remotely through aerial imagery and data. Light Detection and Ranging (LiDAR)-derived imagery shows mathematically interpolated ground surface elevations by removing vegetation interference. Publicly available LiDAR data for the site were reviewed from a report titled "PSLC King County 2016-2017 LiDAR Final Technical Report." These data were acquired by Quantum Spatial between February and August of 2016. Figure 3 presents the most recently available LiDAR data utilized in this study.

Patterns: LiDAR data were used to identify recent, historic, and relic alluvial features. Relic meander channels are located to the north, east, and southeast of the subject property. The stream channel within the study segment appears to have been modified by the placement of large woody debris in the channel. The timing of the bank modifications is unclear. Meander positions appear generally constant in the record and additional meander growth appears to be fairly well constrained outside the subject cutbank. All the actively eroding bank locations are composed of non-cohesive materials, which support moderate erosion rates based on the historical trend in the area. Short term bank erosion rates at the subject meander throughout a recent photographic record (since 2005) range from 1.9 ft/yr to 2.2 ft/yr within the actively eroding banks, and a rate of 14.9 ft/yr during the 2020 flooding season.

Historically-Reconstructed Rate of Migration: The reach-averaged bank erosion rate for the CMZ delineation reach affecting the site was calculated by dividing the total eroded floodplain area interpreted to be shown in the historical aerial photograph record by the length of the bank edge adjacent to the floodplain, then by the number of years composing the record. The oxbow lake to the southeast of the site was removed from the Historical Migration Area calculation because its origin and periodic presence was likely an agricultural irrigation modification in the early- to mid-20th century.

Table 3 – Reach Variables Utilized in Calculation of Long-Term Average Bank Erosion Rate

Variable	Value
1936 Active Channel Area	78,840 ft^2
2021 HMZ Area	145,052 ft^2
Historically Eroded Area	66,212 ft^2
Erodible Length	1,045 ft
Average Erosion Rate	**0.75 ft/yr**

The bank erosion rate was generally consistent across the study area, outside the subject meander. In specific proximity to the subject site, the main channel migrated a total of about 64 feet westward in 85 years, with an average rate of 0.75 feet/yr. Meander erosion was substantially greater, as previously described.

SENSITIVE AREA EVALUATION

Channel Migration Zone (CMZ) Delineation

We utilized the guidelines in Section 2 of the Forest Practices Board Manual (DNR, 2004) to delineate the CMZ within proximity to the study site. In accordance with the guidelines, a CMZ comprises three distinct areas: the Historical Migration Zone (HMZ), the Avulsion Hazard Zone (AHZ), and the Erosion Hazard Area (EHA). Our CMZ delineation is presented in Figure 8.

Historical Migration Hazard (HMZ): The historical migration hazard was delineated as the spatial sum of all interpreted channels and active side channels originating in the subject reach and visible in aerial photography between 1938 and 2018. To account for distortion and error, slight adjustments were made to match photography to current LiDAR imagery. Due to the extensive forested canopy near the stream, the bank line was sometimes obscured by vegetation and approximated.

Avulsion Hazard Zone (AHZ): Relic side channels seen on LiDAR imagery and historic avulsions recorded in the aerial photography indicate that avulsions are possible in the study area. Avulsion hazards were delineated within floodplain areas where bankfull conditions may selectively divert flow to topographic low points. Systemic aggradation or woody debris may also affect the possibility of avulsion within the study area. Depending on concentrations of flow, avulsion may occur within the point bar of the meander across the river from the property, especially if the side channel develops at a rapid pace.

Erosion Hazard Area (EHA): The Erosion Hazard Area is based on the average bank erosion rate within the reach. We calculated the average erosion rate to be 0.75 ft/yr, but localized rates vary. All actively eroding banks have exposures of alluvial materials. The average rate of erosion was extrapolated over the 75-year design life of a structure to determine the erosion hazard area. A 56-foot erosion buffer has therefore been conservatively applied to the outside of the main channel, beginning along the top of the steep bank slope within the subject property and extending westward.

Disconnected Migration Areas: Disconnected migration areas are those which are behind permanently maintained levees, dikes, or public rights-of-way. No disconnected migration areas were mapped within the project vicinity.

Scour Assessment

The subject site is situated on a meander where a significant change in flow direction occurs. When streams bend, the deepest portion of the cross section moves to the outer portion of the channel and scour occurs at the bend location – the cutbank. High shear stress develops immediately downstream of the bend and increases proportionally with the relative tightness of the bend.

Similarly, an abrupt bend in the stream accommodates erosive energy in a 'sink' and can create 'jet scour' pools at the bend to dissipate the energy of the flow's momentum as it changes direction. The landward pools shown on the Cross Sections in Figures 5 through 7 depict this method of scour.

Estimations of scour depth can be made with empirical formulae for most types of scour, with the exception of 'jet' scour, which will continue to occur until an equilibrium is met between the energy sink and the erosive momentum of the flow. For the purposes of approximating scour depth at the meander to facilitate repair and stabilization alternatives, we calculated scour depth based on the empirical Thorne formula for meander scour.

Equation 1 – Thorne Equation for Meander Scour:

$$\frac{d}{y_1} = 1.09 - \log\left(\frac{R_C}{W} - 2\right) for\ 2 < \frac{R_C}{W} < 22$$

Where:

d= *maximum depth of scour below local stream bed elevation*
y_1= *average flow depth directly upstream of the bend*
W= *width of flow*
R_C= *radius of curvature at channel centerline*

We calculated an approximate meander scour depth of the stream to be 4.3 feet based on an $\frac{R_C}{W}$ value of 2.97 and an average flow depth of 3.88 feet, determined from aerial imagery and field reconnaissance, respectively.

CONCLUSIONS AND RECOMMENDATIONS FOR STABILIZATION

General

It is our opinion from a geotechnical standpoint that the parking lot and administration facility operated by Issaquah School District is within an erosion hazard area associated with channel migration and other hazards from Issaquah Creek. Without permanent stabilization, the meander will continue to erode and undermine public facilities and infrastructure. Since most highly erosive events in proximity to the site have historically occurred during periods of intense flooding, further alterations to the existing channel are likely to occur in future floods. It is therefore impractical to give a precise lifespan of existing facilities and infrastructure based on background erosion rates, given the changing frequency in which flooding will occur in the future and the dynamic changes in the stream channel morphology which can occur during flood events. For the purposes of this study, we consider the parking lot and underlying utilities to be effectively compromised by the erosion hazard, an active condition which warrants urgent streambank stabilization.

In the remainder of this report, we discuss possible stabilization alternatives for the affected cutbank, implications and impacts on the surrounding channel migration zone from these alternatives and provide design-level recommendations for construction of the most practical methods.

Objective: To take action to restore channel morphology and minimize the risk erosion poses to the parking lot area while protecting the aquatic productive capacity of the site.

Background: We interpret Issaquah Creek to be degrading and incising in the subject stream reach. Evidence for degradation includes historic widening of the alluvial flood plain, continual oversteepening and periodic collapse of banks, and the presence of small knickpoints (thalweg drops) along the channel profile in the vicinity of the site. Given the 14.9-foot recession of the cutbank between 2019 and 2020, it is clear the momentum and energy of the stream is channeled toward the meander below the parking lot, which has been critically undermined. Temporary stabilization measures, while sufficient to prevent ongoing erosion, do not meet standards for streambank stabilization in accordance with the City of Issaquah Shoreline Master Program, or requirements from other agencies for permanent stabilization.

Stabilization techniques will require structural improvements in combination with bioengineering and reconstruction of the bank in order to withstand the erosive power directed at the site, an expected increase in the frequency of flooding events on Issaquah Creek due to changing climate, and cause no net loss in aquatic function in accordance with state requirements.

Technical Design Criteria

To achieve the objective established by Issaquah School District, the following technical design criteria were developed to screen and guide possible stabilization alternatives for the project site:

- Stabilization measures shall account for potential bed degradation of 4.3 feet in the event channel degradation continues.
- At a minimum, bank-toe woody material shall resist buoyancy and shear forces up to and including those that occur during a 10-year recurrent flow.
- Vegetation planted on upper bank shall cover at least 60% of the ground surface by the end of the third year following project implementation.
- At least 80% of the woody plant material shall survive three years after placement.
- Modifications to the bank shall only occur landward of the original OHWM prior to 2019-2020 flooding.
- Project shall be monitored at least annually for 5 years during low-flow periods and during significant flooding events to ensure outcomes are maintained.

Specific requirements for bank stabilization in accordance with the following jurisdictions also screened possible alternatives. An incomplete summary of requirements is presented below for reference.

City of Issaquah – Shoreline Master Program, Chapter 7

Bioengineered shoreline stabilization methods are preferred. New shoreline stabilization shall be planted with vegetation suitable for wildlife habitat. New streambank stabilization structures shall incorporate features that minimize adverse effects on riparian habitat, salmon spawning and migration, and water quality.

New stabilization structures shall be placed landward of the floodway established by FEMA. Hard armoring shall not be authorized unless there is a significant possibility of structural damage within three years.

FEMA – Programmatic Requirements

Streambank stabilization methods include: alluvium placement, vegetated riprap with large wood, log or roughened rock toe, woody plantings, herbaceous cover, deformable soil reinforcement, coir logs, bank reshaping and slope grading, floodplain flow spreaders, floodplain roughness, and engineered log jams, alone or in combination.

Design shall retain natural vegetation and permeable soils and be completed during *Times When Spawning or Incubating Salmonids are Least Likely to be Present in Washington State Freshwaters* (WDFW 2015). Erosion control shall abide by the *Stormwater Management Manual for Western Washington*, as amended by the Washington Department of Ecology.

Vegetated riprap with large wood shall be limited to areas identified as most highly erodible with highest shear stress, and provide compensatory mitigation. At a minimum, the amount of wood incorporated into the treated area shall be equal to the number of whole trees whose cumulative summation of rootwad diameters is equal to 80% of linear-feet of treated streambank or 20% of treated area, whichever is greater. Geotextile fabric should not be used as a filter for riprap or sapping.

Large wood should incorporate intact rootwads, minimally spaced no greater than the average rootwad diameter. Minimum rootwad diameter placed at the toe of structures shall be equal to the bankfull depth, unless availability constrains the project. Space between rootwads may be filled with large boulders, or trimmed or untrimmed woody debris. Boulders should be 1.5 to 2 times the log diameter of adjacent logs, no more than 5 or 6 feet, maximum.

WDFW – Integrated Streambank Protection Guidelines

Guidance for riprap, placement of large woody debris, and rock or wood toe is generally presented in the manual, with emphasis on determining impacts to aquatic habitat and function.

Army Corps of Engineers – Nationwide Permit 13: Bank Stabilization

Banks shall be stabilized with the minimum necessary amount of materials needed for erosion protection, such that no material placed will be eroded by normal or expected high flows. There shall be no more than minimal adverse environmental effects from stabilization. “Stabilization” shall not include stream channelization activities.

Stabilization Alternatives

No Action: If no action is taken, the bank will continue to erode and undermine the parking lot; failure of the parking lot into the stream channel would result in detriment to aquatic habitat and does not meet the objective established by the Issaquah School District.

In-Channel Alterations: In channel alterations to balance the flow energy by artificially dredging an energy sink upstream of the affected bank is not allowed as a stabilization alternative in accordance with FEMA programmatic requirements and Army Corps of Engineers restrictions.

Riprap Armoring: While structurally capable of restoring the bank morphology and minimizing the risk erosion poses to the infrastructure, riprap armoring does not meet the preference of the City of Issaquah for stabilization, nor does it meet the 'no-net-loss of aquatic habitat function' requirement from the State of Washington. Riprap armoring does not sufficiently 'roughen' the streambank to provide commensurate habitat to what would be lost by minimizing erosion and armoring the bank.

Bioengineered Stabilization: Biotechnical stabilization (plantings) methods alone are not enough to protect against toe erosion caused by jet scour at this site. While woody plantings and herbaceous cover can increase aquatic function and habitat value, a structural solution is necessary to meet the **Technical Design Criteria**. Constraints based on the amount of space between the original OHWM and the undermined parking lot are not enough to account for the 4.3 feet of possible scour at the toe of the cutbank, nor to resist buoyancy and shear forces at the outside edge of the stream meander.

Vegetated Riprap with Large Wood: It is our opinion that the preferred alternative for stabilization which aligns with the requirements of permitting jurisdictions and the objectives of the Issaquah School District is a combination of structural and biotechnical methods. A Schematic Design Plan for this approach is presented in Figure 9. Large woody debris will be placed in a latticed, cribbing structure constructed landward of the original OHWM. Stream boulders and alluvial material will be utilized to reconstruct the eroded bank within the large woody structure, which will have rootwads fronting the channel to recruit sediment and debris, and to provide aquatic habitat value and mitigate the effects of rock placement. To mitigate bed degradation and expected stream incision, the large wood will be placed at a depth of 4.3 feet below the existing channel to prevent future undermining, should the channel continue to incise. It will extend vertically to protect the bank during periods of flooding. Resistance of shear and buoyancy will be addressed with mechanical anchors drilled into the dry bank prior to construction of the large woody debris reinforced bank toe.

Channel erosion will likely continue to occur in the vicinity of the stabilized bank. Particularly, we would expect residual erosive forces to at first affect the southwestern cut bank immediately upstream of the stabilized bank. It is also possible for the erosive power of the jet scour targeted at the subject bank to move downstream of the anchoring point of the stabilization and repair. The Army Corps of Engineers 'Hydrologic Engineering Center's River Analysis System' (HEC-RAS) software was utilized to calculate flow and analyze sediment transport models. Calculations are presented in **Appendix C**. Based on our preliminary assumptions, the proposed vegetated riprap with large woody debris bank treatment will not result in substantial impacts to the base flood storage capacity on neighboring sites.

Design Guidance

Anchor Points and Extent of Stabilization: It is critical that the bank repair and stabilization area encompass portions of the bank most susceptible to high shear forces and local scour, with the understanding that stabilizing the entire streambank within the property may redirect some scour downstream. Natural anchor points shown on the Schematic Design Plan in Figure 9 are boundary points encompassing the minimum necessary area of the bank both affected by ongoing scour and posing the highest level of risk to infrastructure. The resultant minimum extent of stabilization and bank treatment is approximately 110 linear feet. Streambank modifications shall only occur landward of the prior floodway boundary indicated on the survey established by FEMA on the FIRM panel dated August 19, 2020. The prior floodway boundary in the vicinity of the subject area represents the edge of water prior to the 2020 flooding and subsequent scour.

Construction Considerations: Excavations adjacent to the bank will be required in order to place the large woody debris at sufficient depth to prevent future scour from undermining the installation. At present, the edge of water intersects the proposed bank reconstruction area, even during low-flow portions of the year. Any bank stabilization work in the vicinity of Issaquah Creek must only occur during the WDFW 'fish window'. Since bank stabilization will only occur landward of the prior floodway boundary, the primary stream channel should remain accessible during construction and a temporary bypass of the stream reach will not be necessary due to the anticipated limited disturbance of the channel for the installation.

We estimate the stream stage during the 'fish window' to require partial, temporary barriers of less than 3.0 feet of water at the time of construction. Temporary cofferdam plans shall be developed by the contractor and reviewed by NGA prior to construction. Sandbags with an impermeable liner, water-filled bags or tubes, or collapsible, portable, fabric membranes could be used as temporary water diversion methods for the cofferdam.

Sheet piles may be used if necessary, depending on construction access requirements and hazards. If used, sheet piles shall be designed in accordance with WSDOT standard specification 2-09.3 (3) Section D. In any case, we recommend any temporary cofferdam be installed a minimum of 12-inches above the deepest water surface elevation along the cofferdam alignment associated with the recent 2-week high stage of the stream to prevent overflow flooding in the work area.

Temporary dewatering landward of the partial cofferdam within the work area shall occur in accordance with Element 10 of the SWPPP requirements section outlined in Volume I Chapter 3 of the 2019 Stormwater Management Manual for Western Washington, by the Washington State Department of Ecology. Discharge of water back into Issaquah Creek shall be downstream of the work area and limited to only clean, non-turbid waters. Pump intakes shall be screened at all times. Discharge shall only occur in a manner that does not cause erosion or flooding of downstream waters. Highly turbid waters shall be detained and treated with an appropriate Best Management Practice (BMP), such as a portable treatment unit, sand filters, and flocculants for the duration of the temporary dewatering. After temporary, partial diversion is achieved, the contractor and/or project biologist should remove any stranded fish.

Erosion control methods and temporary dewatering should be observed by a Certified Erosion and Sediment Control Lead (CESCL), which can be staffed by representatives of NGA during construction. BMPs should be used to control erosion before, during, and after construction occurs. For example, stockpiles should be covered during inclement weather, and storm grates should include removable sediment traps. Careful consideration by the contractor should be made prior to construction to ensure placement and staging of materials does not impact the streambank. NGA should review a Temporary Erosion and Sediment Control (TESC) plan prior to construction.

Shoring and Temporary Excavations: Temporary cut slope stability is a function of many factors, including the type and consistency of soils, depth of the cut, surcharge loads adjacent to the excavation, length of time a cut remains open, and the presence of surface or groundwater. It is exceedingly difficult under these variable conditions to estimate a stable, temporary, cut slope angle. Therefore, it should be the responsibility of the contractor to maintain safe slope configurations at all times as indicated in OSHA guidelines for cut slopes.

The following information is provided solely for the benefit of the owner and other design consultants and should not be construed to imply that Nelson Geotechnical Associates, Inc. assumes responsibility for job site safety. Job site safety is the sole responsibility of the project contractor.

It is our opinion that the recently installed temporary steel sheet pile stabilization method may be able to be used to support temporary cut excavations around the proposed permanent repair, and that decommissioning of the temporary stabilization should occur incrementally during the installation of the permanent structures. For planning purposes, we recommend that temporary cuts in the upper undocumented fill and alluvial soils be no steeper than 2.5 Horizontal to 1 Vertical (2.5H:1V). If significant groundwater seepage or surface water flow were encountered, we would expect that flatter inclinations would be necessary. If temporary cut excavations are not able to achieve the above recommended inclinations, we should be retained during construction to collaborate on temporary shoring solutions with the contractor.

Large Woody Debris (LWD): LWD shall be competent, not rotten, and in good condition. Large branches and tangled roots are preferred and should not be trimmed if possible. LWD and rootwads shall be utilized from live trees and shall have a minimum of 30 feet of tree stem including the rootwad unless otherwise noted on the Schematic Design Detail in Figure 10. Depending on sources of LWD, logs may need to be cut into pieces for transport then reassembled on-site by splicing, gluing, and tacking the pieces back together. In accordance with FEMA programmatic requirements, the summation of rootwad diameters utilized for the project must equal 129 linear feet. Therefore, the minimum amount of large woody debris with rootwads is 16 pieces with 12-foot diameter rootwads, or 24 pieces with 8-foot diameter rootwads. All logs shall have a minimum diameter at breast height (DBH) of 18 inches. All LWD shall have a minimum diameter of 10 inches at the small, tapered end unless otherwise noted. LWD shall only consist of Douglas fir (*Pseudotsuga menziesii*) and/or western redcedar (*Thuja plicata*), unless otherwise approved by NGA and the project biologist. We recommend each LWD piece be evaluated by NGA prior to transport to the site for staging. Long logs should be trimmed on site to be situated as close as possible against the steep bank, sharpened and pressed into the bank where possible as well.

Placement of Fill: Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures might include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction.

The area to receive the fill should be suitably prepared prior to beginning fill placement. Excavations should make terraced, flat cuts and exposed subgrades should be maintained in a semi-dry condition. The contractor should plan to limit machinery from sensitive areas where possible, and/or plan for impacts related to machinery in proximity to the creek. We anticipate impacts could be limited by using large excavators with arm extensions and flat buckets to complete site grading, and/or a boom truck or crane situated in the parking area above the creek to install and situate the large woody debris and heavy rock.

Since wet conditions are likely to be encountered, special site stripping and grading techniques might be necessary. It may be necessary to cover exposed subgrades with a layer of crushed rock for protection. When wet conditions are encountered, the subgrade should not be compacted as this could cause further subgrade disturbance. In wet conditions, it may be necessary to cover the exposed subgrade with a layer of crushed rock as soon as it is exposed to protect the moisture sensitive soils from disturbance by foot traffic during construction. Surface water and seepage should be diverted around prepared subgrade.

In general, all filling should be accomplished in uniform lifts up to eight inches thick. Each lift should be spread evenly and be thoroughly compacted prior to placement of subsequent lifts. All structural fill underlying building areas and pavement subgrade should be compacted to a minimum of 95 percent of its maximum dry density. Maximum dry density, in this report, refers to that density as determined by the ASTM D-1557 Compaction Test procedure. The moisture content of the soils to be compacted should be within about two percent of optimum so that a readily compactable condition exists. It may be necessary to over-excavate and remove wet soils in cases where drying to a compactable condition is not feasible. All compaction should be accomplished by equipment of a type and size sufficient to attain the desired degree of compaction and should be tested.

Rock Requirements: '*Fish Mix Gravel*' shall consist of washed, round fluvial (river) gravel consisting by volume of 60% sand to 2-inch diameter rock, in accordance with WSDOT standard specification 9-03.11 section (1), 20% 2- to 6-inch diameter rock, and 20% 6- to 18-inch diameter rock per section (2). 'Fish Mix' shall be supplemented as necessary with native bed material and/or imported pit run in order to match existing bed material gradation and prevent subsurface flow.

Anchor *'Habitat Boulders'* shall be 2, 3, and 4-man rock in accordance with WSDOT specifications and indicated on the Schematic Design Detail in Figure 10. Streambed cobbles and boulders shall meet WSDOT standard specification 9-03.11 Sections (2) and (3). Large anchor rocks shall be sourced from a naturally occurring fluvial sediment and shall thus be rounded or semi-rounded as possible.

'Riprap' should meet WSDOT standard specification 9-13.1 (2) for light loose rip rap, and quarry spalls should meet WSDOT standard specification 9-13.6.

Tieback Anchors: Tieback anchors will secure the large woody debris to the undisturbed bank to prevent loss and impacts during future flooding events. As shown on the Schematic Design Detail in Figure 10, two sets of anchors will be utilized to secure the placement of the large woody debris. One set of anchors will be near the outboard face of the woody debris and oriented directly downward to redundantly counteract buoyancy forces on the structure. Another set will be situated at a downward angle into the bank and secure the back of the woody debris as a precautionary measure in the event the sharpened ends of anchor logs are unable to be appropriately pressed into the bank.

The contractor should determine the torque values required to achieve the desired capacity. Load carrying capacities on the order of 10 kips or more could be achieved using a triple-helix with 8-, 10-, and 12-inch diameter anchor installed successfully. However, the anchors should advance a minimum of 20 feet into undisturbed soils to achieve sufficient capacities. The helical anchors should be installed as recommended by the supplier using torque levels correlating the desired capacities. Anchors should be spaced a minimum of three times the diameter of the largest helix of the anchor on center. We recommend that we review proposed anchor installation methods from the contractor. We should also observe anchor installation and testing.

Two anchors should be performance tested to 200 percent of the anchor design capacity. The performance test should consist of cyclic loading in increments of 25 percent of the design load, as outlined in the Federal Highways Administration (FHA) report No. FHWA/RD-82/047. The test location should be determined in the field, based on soil conditions observed during anchor installation.

Cabling: Anchorage shall be fastened using 5/8" minimum diameter galvanized or stainless-steel cable, or hot-dip galvanized 5/8" diameter steel chain as indicated on the Schematic Design Detail in Figure 10. Notches a minimum of 1-inch in depth should be made on large woody debris for cable placement. All chain and cable shall be fastened with hot-dip galvanized steel clamps and liberal quantities of hot-dip galvanized 3/8" x 4" steel staples. Epoxy used for anchorage should consist of Hilti HIT-HY 150 resin adhesive or equal.

Vegetation and Restoration: Revegetation shall be completed with native riparian species to be determined by the project biologist and in accordance with prevailing jurisdictional requirements. Density and timing of restoration plantings should also be coordinated by the project biologist. Consideration should be made for plants compatible with the climate of the planting site, reasonable availability, probability of successful establishment, and ability to meet targets for biodiversity and habitat which may be associated with various stakeholder and jurisdictional requirements. In any case, watering and maintenance recommendations for plantings should be supplied by the project biologist to the Owner to ensure successful establishment of the revegetation over a three-year period, consistent with the **Technical Design Criteria** subsection of this project.

Degradable, all-natural coconut coir matting or jute netting should be installed on restoration areas prior to planting, and this erosion control surfacing staked with 18- to 24-inch long, wedge-shaped stakes made by cutting untreated 2x4s diagonally. Stakes should be placed in regular intervals no greater than three feet on-center, and erosion control fabric should incorporate an overlap of at least a foot in restoration areas. We do not recommend synthetic reinforcement mats at this site to prevent microplastic debris from entering Issaquah Creek as a result of this bank stabilization and habitat restoration project. Metal stakes and/or staples or small wooden pegs for tacking erosion control fabrics are similarly incompatible with desired outcomes for the project.

Monitoring Requirements

Construction Monitoring: NGA should be retained to monitor installation and construction of the permanent bank repair at this site. Specifically, we should review TESC plans and temporary partial dewatering plans developed by the selected contractor. During construction, we should review the import of large woody debris to the site, and selection of various rock as fill. We recommend we be present to observe construction of temporary partial dewatering, excavations, tieback anchor installation, large woody debris placement, rock placement, anchorage, and fill on a full-time basis. We should be retained part-time during construction to observe restoration, replanting, and erosion control.

Ongoing Monitoring: Monitoring of the project after construction shall be in accordance with programmatic requirements by FEMA and those of the Army Corps of Engineers. Specifically, we recommend monitoring be conducted during or following 2-year or higher flow events for a minimum of five years following project completion. Loose LWD should be re-anchored, and damage should be assessed during these visits. Hydrologic impacts of the project should be measured periodically within the five-year monitoring period.

Monitoring should result in measurable outcomes to determine project success, as outlined in the **Technical Design Criteria** subsection of this report. Specifically, upstream and downstream geomorphic impacts should be monitored with cross sectional surveys annually during low-flow periods. Video should be recorded to observe local flow patterns during high-flow events. Habitat monitoring should consider percent cover or shading of the stream over time, and plant-survival rate. A summary of recommended long-term monitoring activities is presented in Table 4 below.

Table 4 – Recommended Long-Term Monitoring Program

Monitoring Goal	Metric	Monitoring Frequency	Timing
• Local Impacts • LWD Remains In-Tact	• Qualitative geomorphic observations • Measured Cross Sections	Annually, Five Years	Early Low-Flow Event
• 60% Plant Survival • 80% Plant Coverage	• Planting Survey	Annually, Three Years	Growing Season End
• Stability during High Flow • High Flow Hydrology	• Video Records • Qualitative geomorphic observations	As needed, Five Years +	>2-year High-Flow Events

USE OF THIS REPORT

NGA has prepared this report for the Issaquah School District and associated agents, for use in the planning and design of the development on this site only. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. The scope of our work does not include services related to other geologic hazards beside Channel Migration Hazards. There are possible variations in subsurface conditions between the explorations and also with time. The variability in earth materials in the vicinity of the site can influence bank erosion rates and susceptibility. Unforeseen changes in watershed conditions could alter sediment and woody debris inputs upstream of the property, changing predictions of future aggradation. Climate-change impacts will influence the magnitude and frequency of peak flows; more frequent and/or more intense flood events may increase rates of channel migration and erosion at this site.

Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this report was prepared. No other warranty, expressed or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

o-o-o

It has been a pleasure to provide service to you on this project. If you have any questions or require further information, please call.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Carston Curd

Carston T. Curd, GIT
Project Geologist

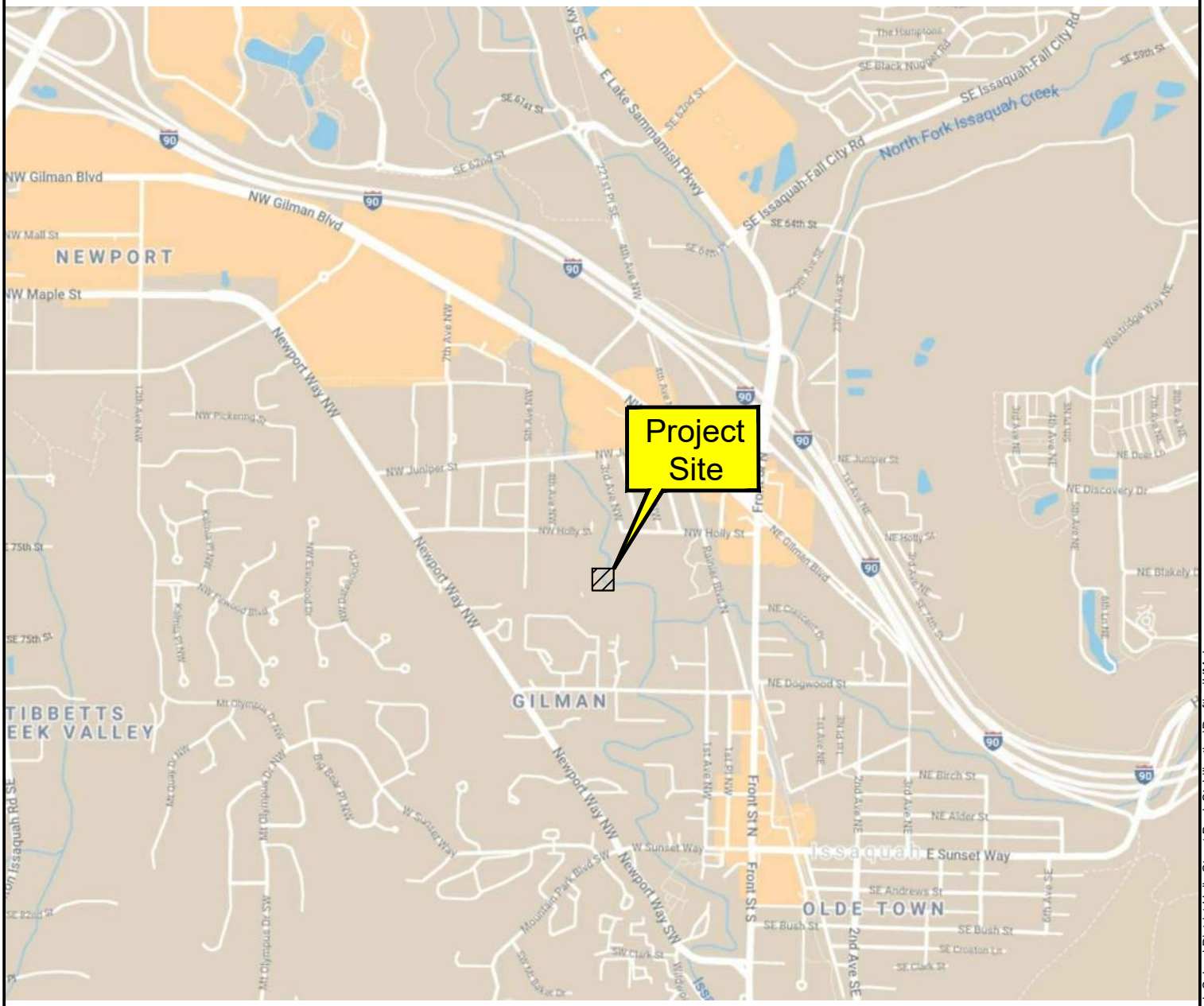
Khaled M. Shawish, PE
Principal

CTC:KMS:ctc

Appendices A, B, C and Ten Figures Attached

VICINITY MAP

Not to Scale



Issaquah, WA

Project Number 1228720	Issaquah Creek Bank Stabilization Vicinity Map	NELSON GEOTECHNICAL ASSOCIATES, INC	No.	Date	Revision	By	CK
Figure 1			1	7/13/21	Original	DPN	CTC

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Wenatchee Office
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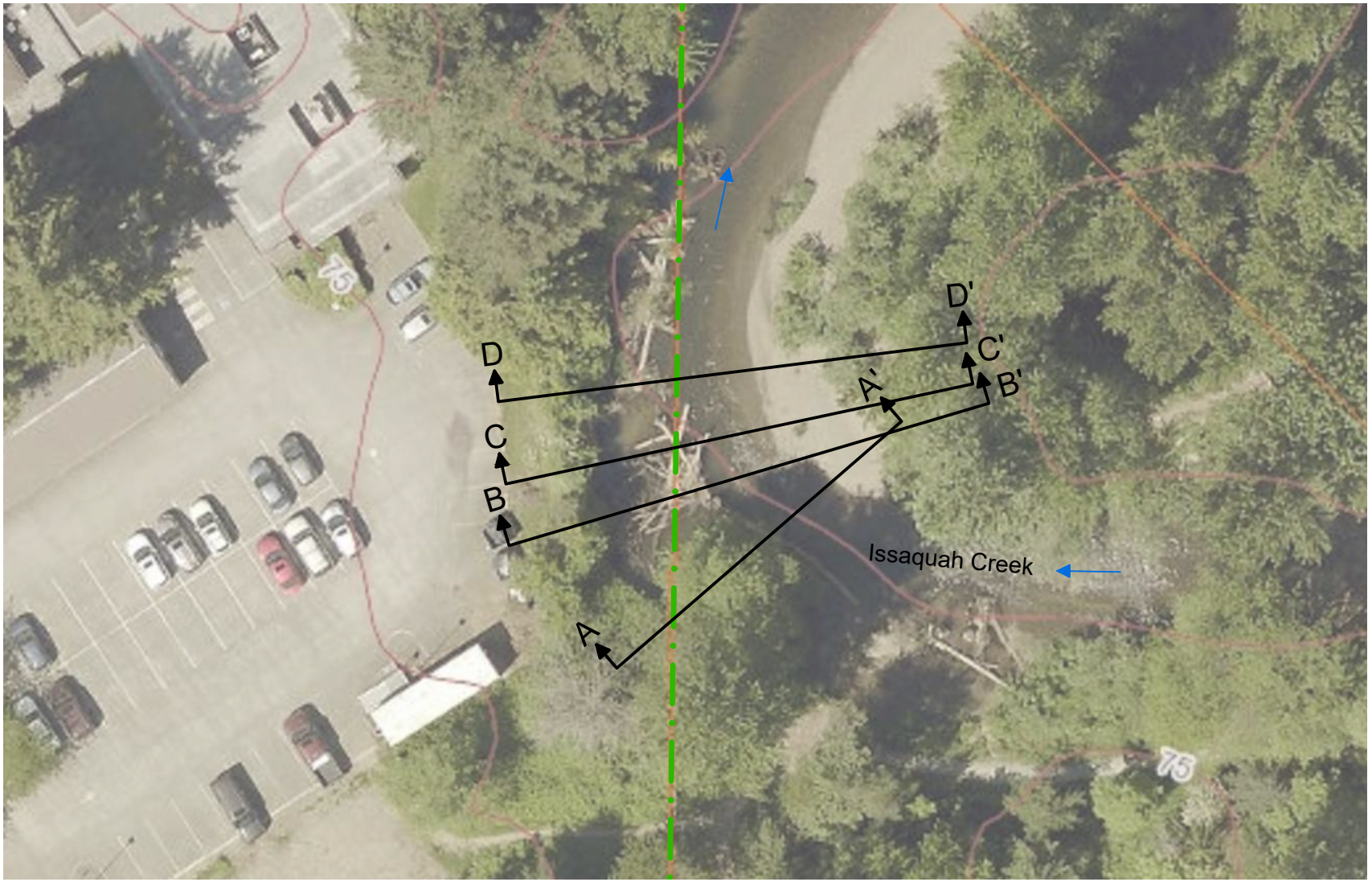
Wenatchee, WA 98801
(509) 665-7696 / Fax: 665-7692

\\hill\company\2020 NGA Project Folders\12287-20 Issaquah School District Holly Street Bank Stabilization\Drafting\VM.dwg

Schematic Site Plan



LEGEND

Property line

A A' Approximate location of cross-section

0 40 80

Approximate Scale: 1 inch = 40 feet

Reference: Site plan based on field measurements, observations, and aerial parcel map review.

Project Number 1228720

Figure 2

Issaquah Creek Bank Stabilization
Schematic Site Plan

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1	7/13/21	Original	DPN	CTC

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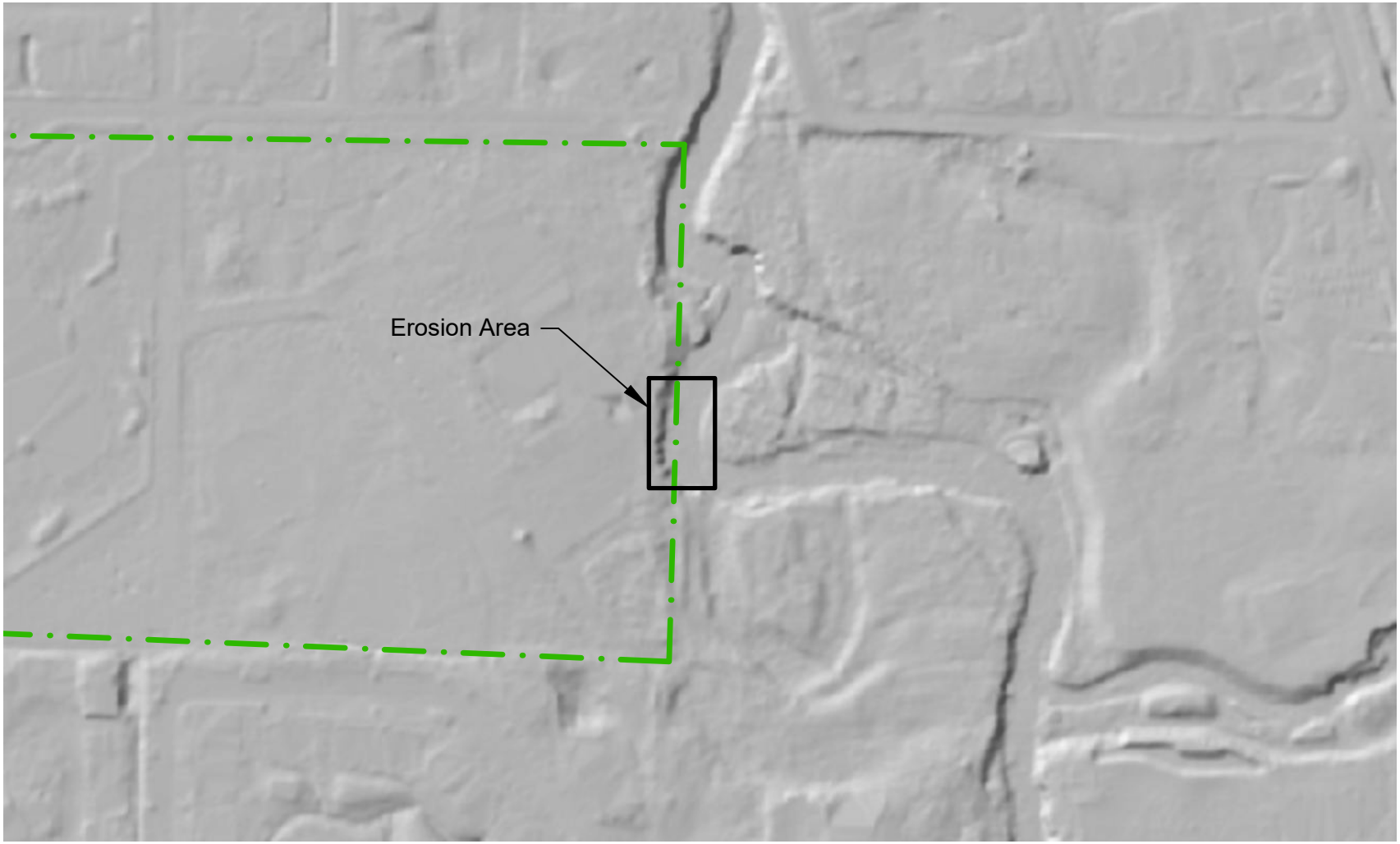
LiDAR Site Plan



N

LEGEND

Property line

0 200 400

Approximate Scale: 1 inch = 200 feet

Reference: Site plan based on field measurements, observations, and LiDAR map review.

Project Number 1228720

Figure 3

Issaquah Creek Bank Stabilization
LiDAR Site Plan

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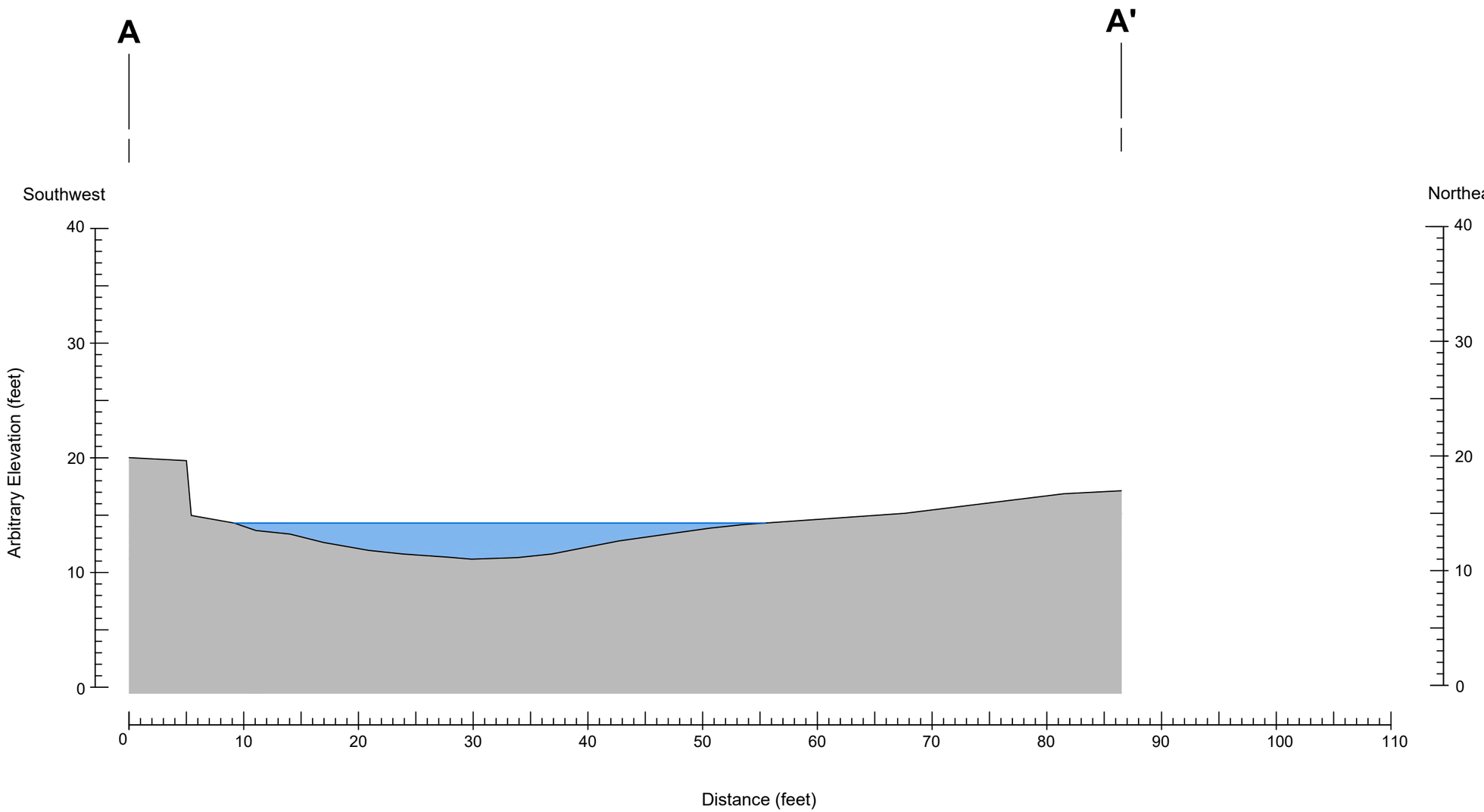
No.	Date	Revision	By	CK
1	9/8/21	Original	DPN	CTC

\\hill\company\2020 NGA Project Folders\12287-20 Issaquah School District Holly Street Bank Stabilization\Drafting\LiDAR.dwg

\\hill\company\2020 NGA Project Folders\12287-20 Issaquah School District Holly Street Bank Stabilization\Drafting\CS.dwg



NOTES:
1) Stratigraphic conditions are interpolated between the explorations. Actual conditions may vary.
2) Elevations are arbitrary.

Reference: Cross Section is based on field measurements using a hand-held clinometer and 100-ft tape measure.

No.	Date	Revision	By	CK
1	7/13/21	Original	DPN	CTC

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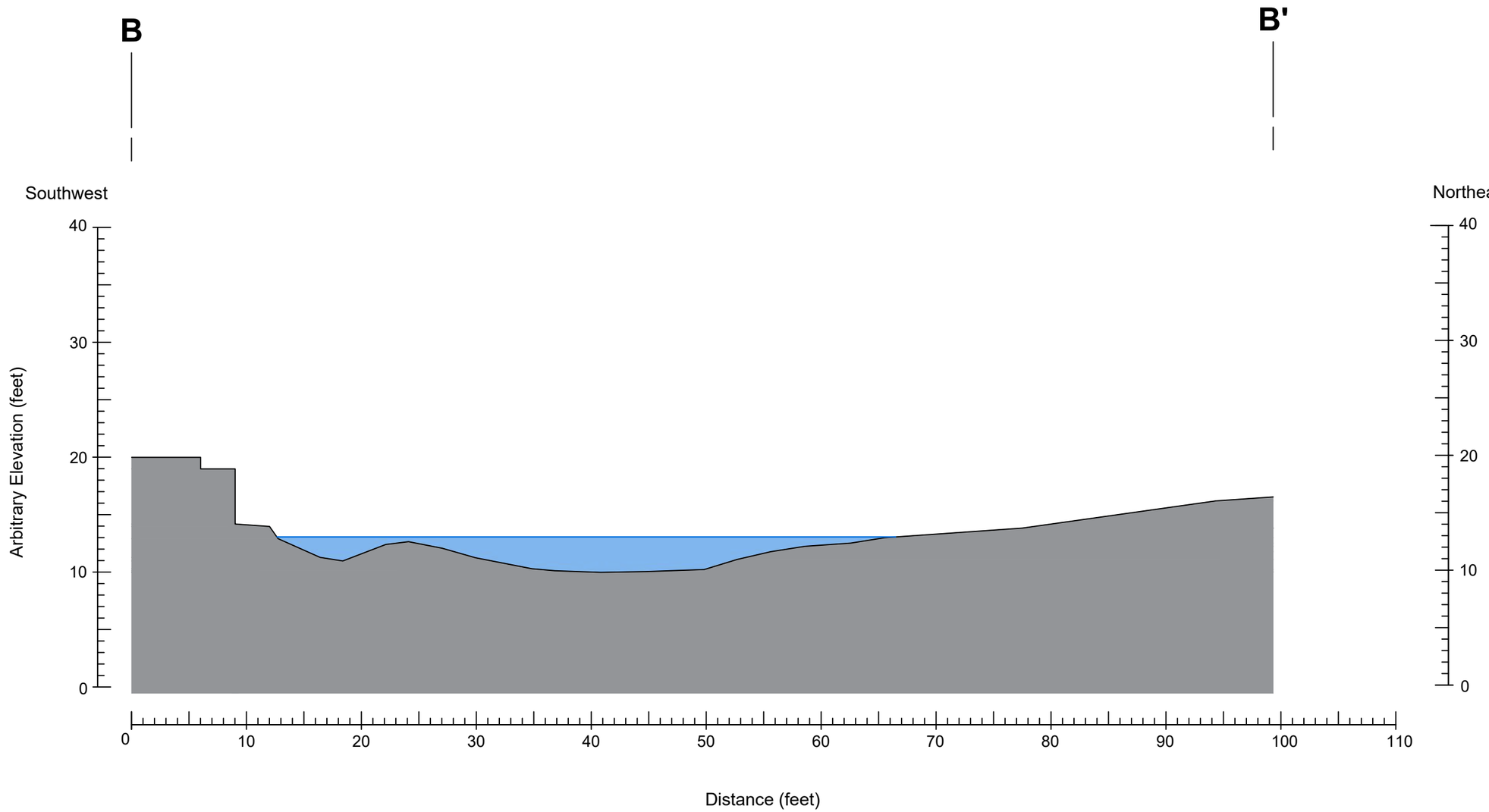
Issaquah Creek Bank Stabilization
Cross-Section A-A'

Project Number 1228720

Figure 4

\\hill\company\2020 NGA Project Folders\12287-20 Issaquah School District Holly Street Bank Stabilization\Drafting\CS.dwg



NOTES:
1) Stratigraphic conditions are interpolated between the explorations. Actual conditions may vary.
2) Elevations are arbitrary.

Reference: Cross Section is based on field measurements using a hand-held clinometer and 100-ft tape measure.

No.	Date	Revision	By	CK
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Issaquah Creek Bank Stabilization
Cross-Section B-B'

Project Number 1228720

Figure 5

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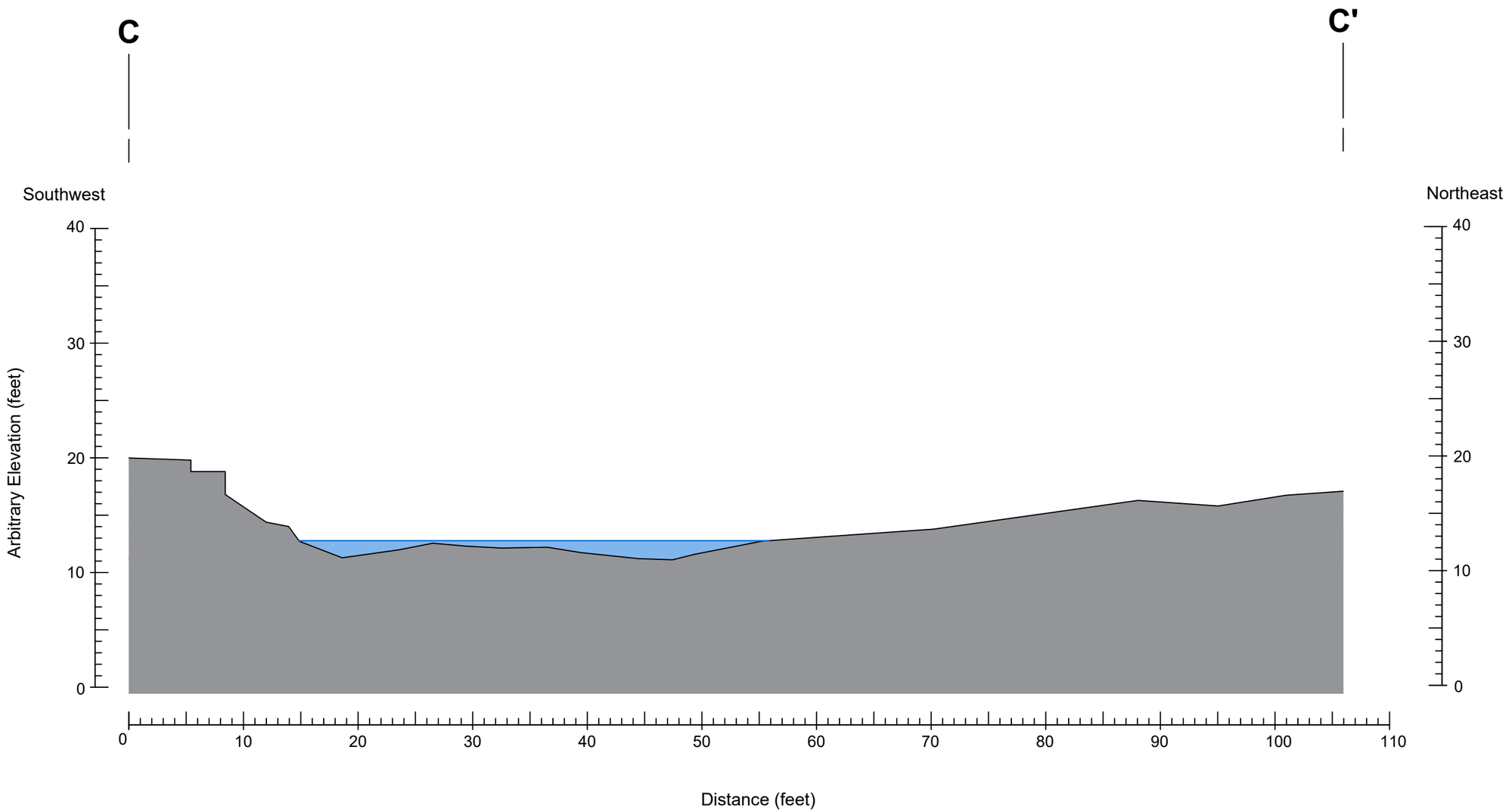

NOTES:
1) Stratigraphic conditions are interpolated between the explorations. Actual conditions may vary.
2) Elevations are arbitrary.

Reference: Cross Section is based on field measurements using a hand-held clinometer and 100-ft tape measure.

No.	Date	Revision	By	CK
1	7/13/21	Original	DPN	CTC

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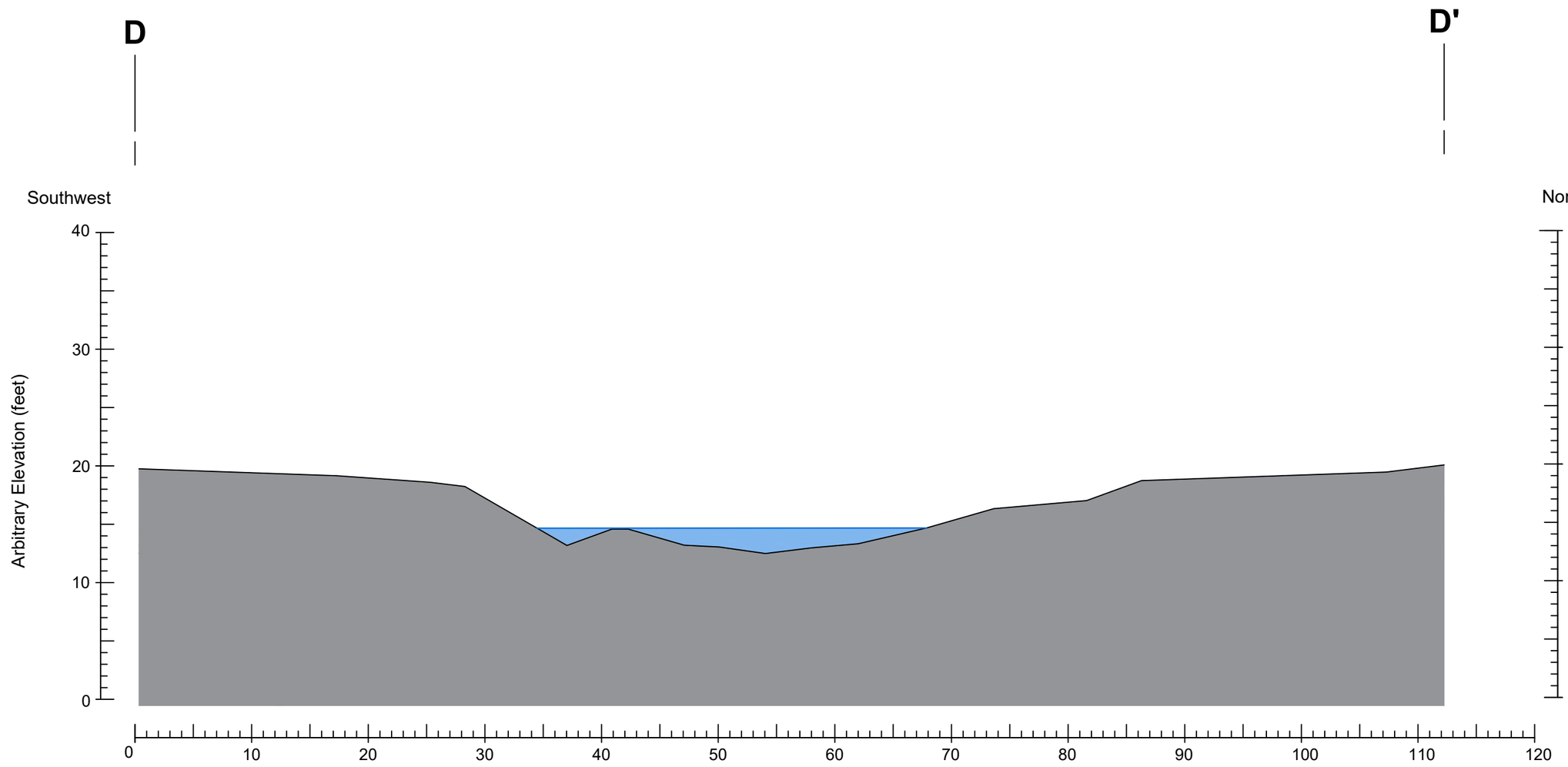
Issaquah Creek Bank Stabilization
Cross-Section C-C'

Project Number 1228720

Figure 6

\\hill\company\2020 NGA Project Folders\12287-20 Issaquah School District Holly Street Bank Stabilization\Drafting\CS.dwg



NOTES:
1) Stratigraphic conditions are interpolated between the explorations. Actual conditions may vary.
2) Elevations are arbitrary.

Reference: Cross Section is based on field measurements using a hand-held clinometer and 100-ft tape measure.

No.	Date	Revision	By	CK
1	7/13/21	Original	DPN	CTC

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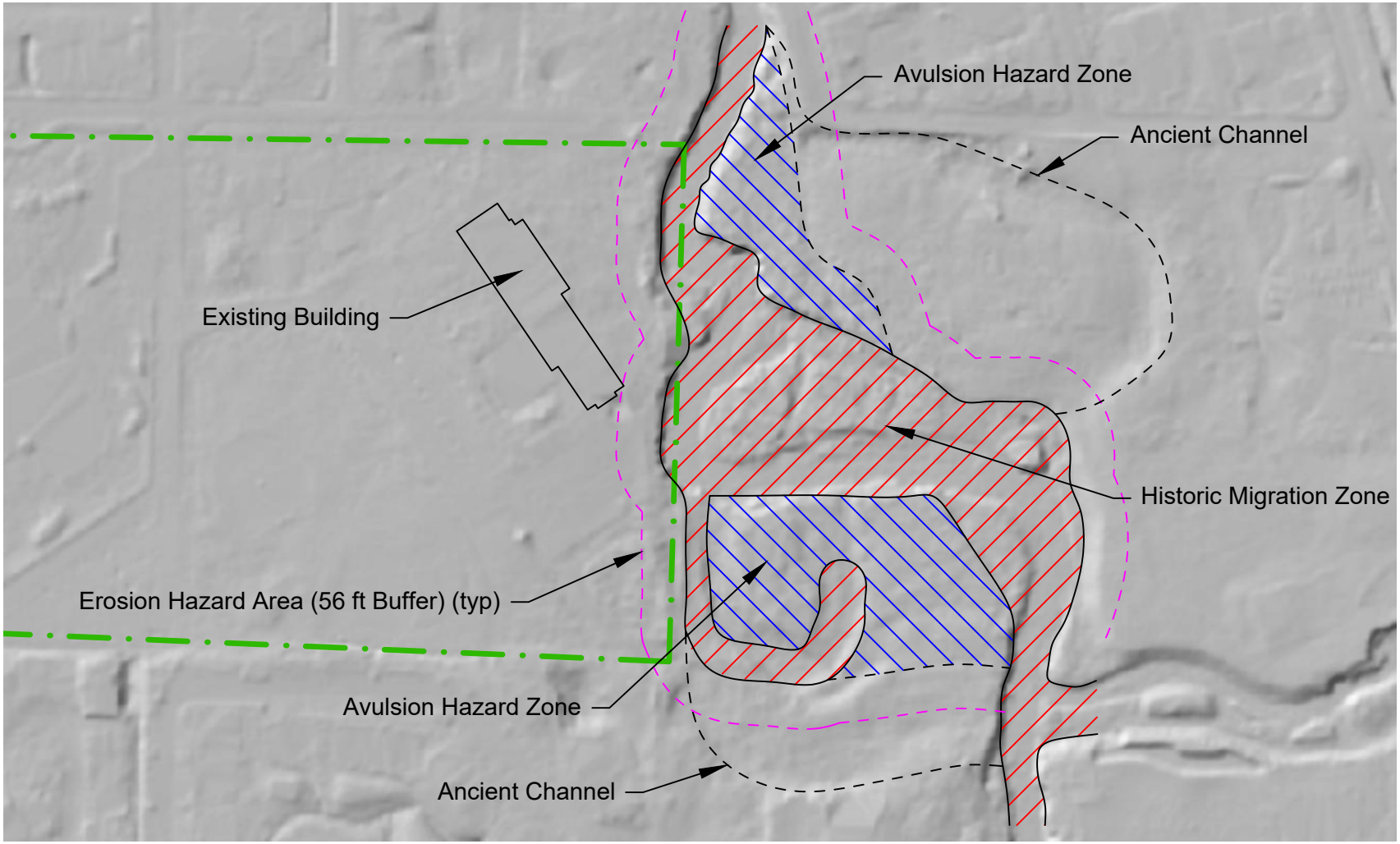
Issaquah Creek Bank Stabilization
Cross-Section D-D'

Project Number 1228720

Figure 7

Channel Migration Hazard Delineation



N

LEGEND

Property line

0 200 400

Approximate Scale: 1 inch = 200 feet

Reference: Site plan based on field measurements, observations, and LiDAR map review.

Project Number 1228720

Figure 8

Issaquah Creek Bank Stabilization
Channel Migration Hazard Delineation

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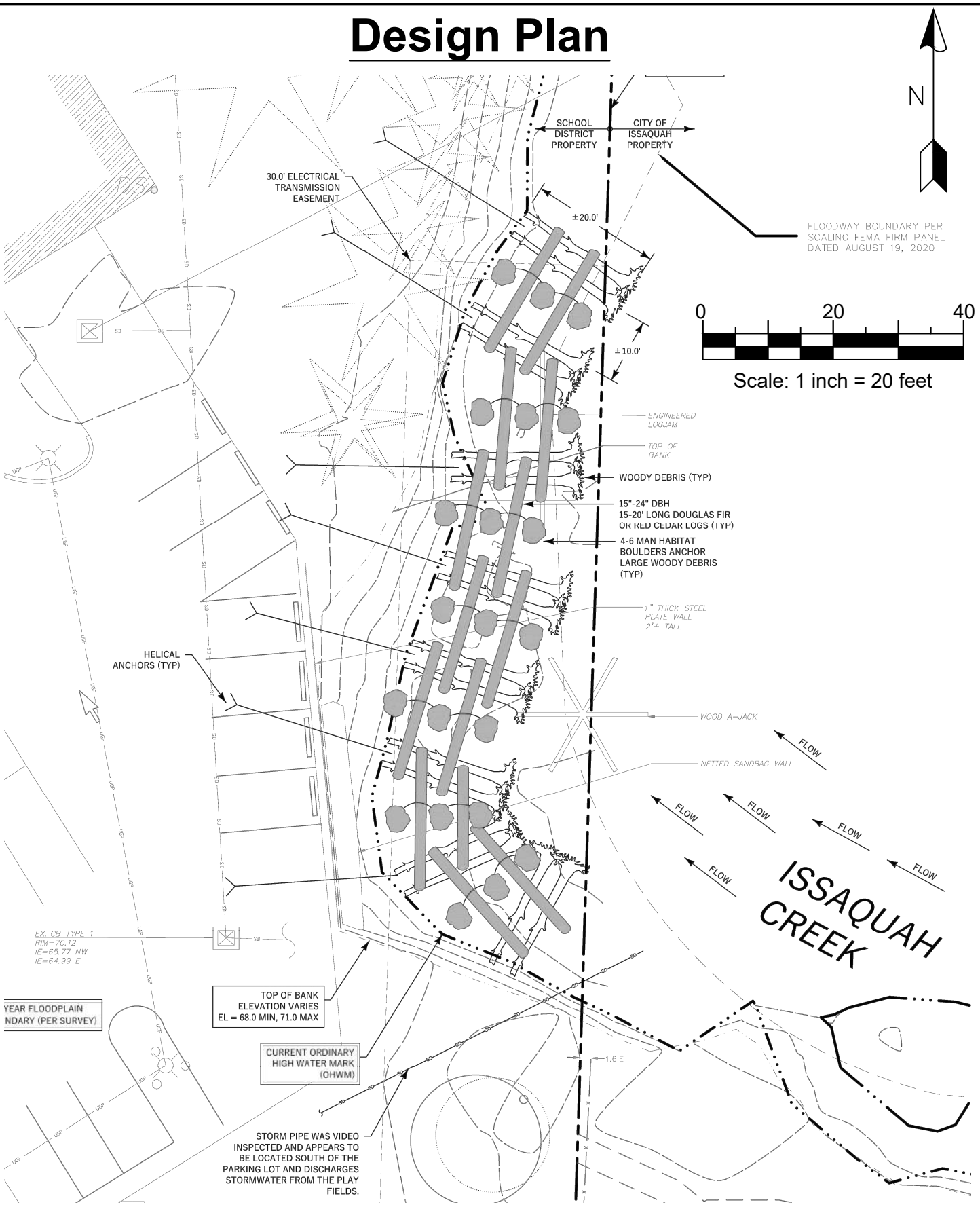
Design Plan



Reference: Design Plan based on a plan dated September 3, 2021 titled "IDS Holly Street Campus Permanent Creek Repair," provided by the Issaquah School District.

Project Number	Issaquah Creek Bank Stabilization Design Plan
1228720	
Figure 9	

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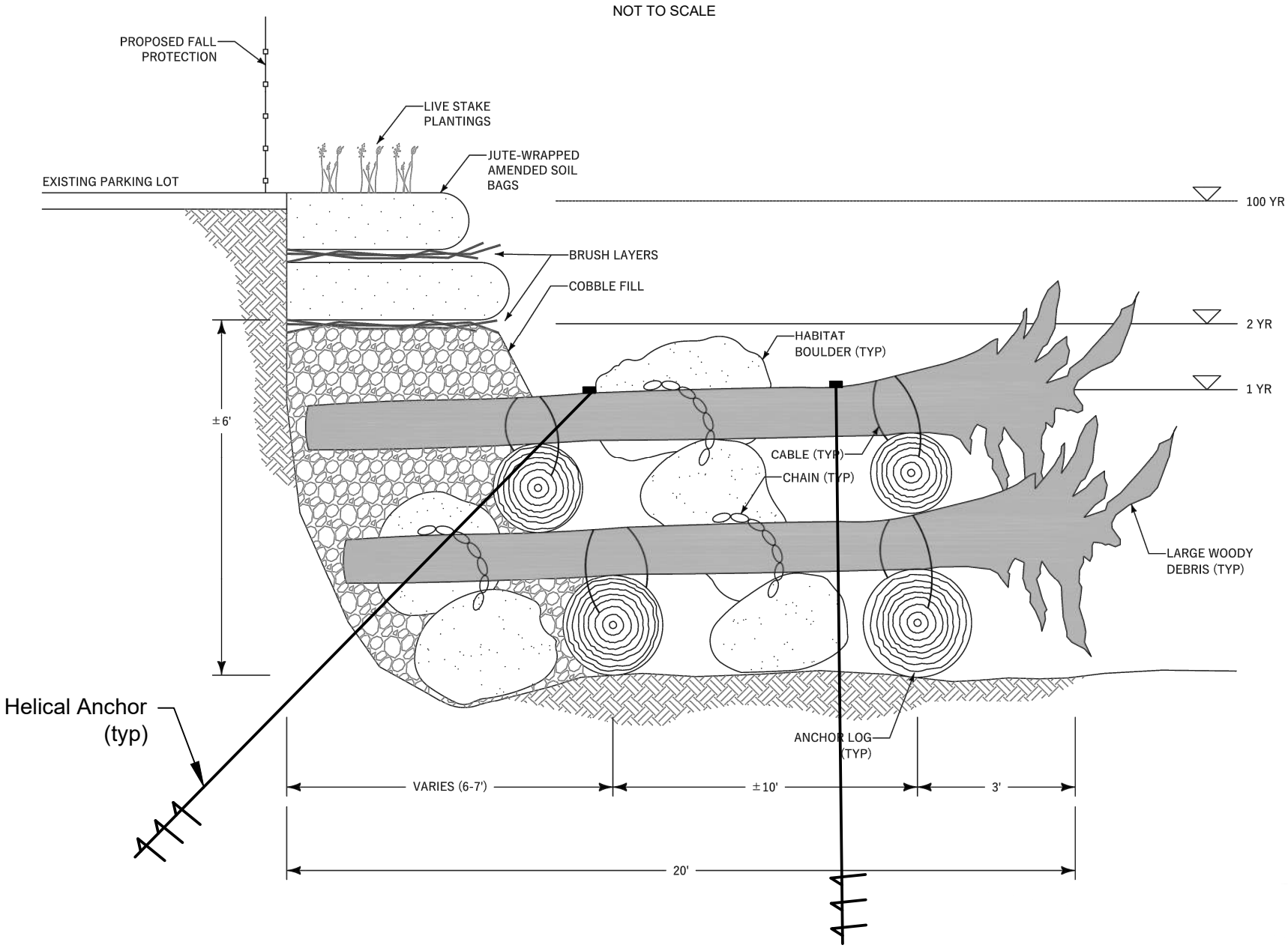
\\hill\company\2020 NGA Project Folders\12287-20 Issaquah School District Holly Street Bank Stabilization\Drafting\Design Plan.dwg

Schematic Design Section

NOT TO SCALE



Reference: Design Plan based on a plan dated September 3, 2021 titled "IDS Holly Street Campus Permanent Creek Repair," provided by the Issaquah School District.

Project Number 1228720

Figure 10

Issaquah Creek Bank Stabilization
Schematic Design Section

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Appendix A: Glossary

Aggradation	An increase in land elevation due to the deposition of sediment
AHZ	Avulsion Hazard Zone: the part of the CMZ where the channel may shift suddenly
Alluvial	Sediment deposited by flowing water or landforms resulting from that type of deposition
Amplitude	A measurement of the maximum, opposite extent of stream meanders
Anthropogenic	Originating in human activity
Avulsion	The process where the stream suddenly shifts to a new channel location
Bankfull Conditions	The width and depth of the active channel at the stage when water just begins to overflow into the active floodplain or bench
Bed Load Transport	The largest of particles transported by stream activity that move along the ground surface by rolling, sliding, or jumping
Channel Migration	The movement of a stream channel back and forth across its valley
CMZ	Channel Migration Zone: for the purposes of this report, the area where the channel may be reasonably predicted to migrate over the 75-year life of the proposed residence
Cutbank	High energy outside bank of a water channel or meander forming a near-vertical bank subject to erosion
EHA	Erosion Hazard Area: the area where future bank erosion is likely
Floodplain	Areas inundated by flood flows
Geomorphic	Having to do with the shape of the earth surface or processes that formed those shapes
HMZ	Historic Migration Zone: the area where the river channel has migrated since approximately 1936
LiDAR	Light Detection and Ranging: remote sensing method using pulsed lasers to precisely measure the surface of the earth
Point Bar	Low energy inside bank of a water channel or meander forming a gentle terrace and subject to aggradation and/ or periodic inundation
Reach	A further section of a segment in the context of watershed mapping
Relic	Surviving remnant of a natural phenomenon, in the context of this study, channel features which are no longer actively conveying surface water
River Miles (RM)	Measurement of distance upstream of the confluence of Issaquah Creek with Lake Sammamish at Lake Sammamish State Park
River Stage	Water level above an arbitrary point measured in feet
Segment	Portion of the watershed subject to study based on similar valley confinement, discharge, channel pattern, and valley gradient ranging from several hundred feet to several miles in length
Stratigraphy	The order and relative position of geologic earth materials
Thalweg	An imaginary line connecting the lowest points of cross sections of a valley or stream
USGS	United States Geological Survey

APPENDIX B

Subsurface Exploration Logs by Others

Associated Earth Sciences, Inc. (AESI) – "Issaquah Creek Bank Erosion Repair," dated July 9, 2020
Site Plan, Borehole Log, CPT Log (3 Plates)

- APPROXIMATE AREA OF TEMPORARY EROSION REPAIR
- CREEK BANK EXPOSURE RESULTING FROM 2020 FLOODS
- EXPLORATION BORING (1999)
- EXPLORATION BORING (2018)
- EXPLORATION PIT (2017)
- MONITORING WELL (2018)
- CONE PENETROMETER (2018)
- PARCEL

DATA SOURCES / REFERENCES:
KING CO: STREETS, PARCELS, PARKS 3/20, STREAMS 1/18
AERIAL PICTOMETRY INT. 2019

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

N

0 80
FEET

BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

associated earth sciences incorporated

EXISTING SITE AND EXPLORATION PLAN

HOLLY STREET CAMPUS - CREEK BANK EROSION
ISSAQUAH, WASHINGTON

PROJ NO.	DATE:	FIGURE:
20180066E002	7/20	2

\\kirkfile2\GIS\GIS_Projects\aaY2018\180066 Issaquah Middle School\mxd\E002\180066E001 F1 F2

associatec earth sciences incorporatec

Exploration Log

Project Number	Exploration Number	Sheet
180066E001	EB-2	1 of 2

Project Name	Issaquah Middle School	Ground Surface Elevation (ft)	
Location	Issaquah, WA	Datum	N/A
Driller/Equipment	Boretec / EC95 Rubber Track Drill	Date Start/Finish	4/30/18,4/30/18
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	8 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Gravel					
				Fill					
		S-1		Very moist, grayish brown, fine SAND, some silt, some gravel (SP).			2 1 2	▲3	
5		S-2		Moist, gray, fine sandy, SILT; faintly laminated with rust colored laminae (ML).			7 6 5	▲11	
				Younger Alluvium					
				Moist, orangish brown, medium SAND, some silt, some gravel (SP).					
10		S-3		Wet, brown, silty, fine SAND, some gravel (SM). Wet, orangish brown, slightly sandy, GRAVEL, some silt (GP). Free water in spoon. Some drill chatter.		▼	12 13 12	▲25	
15		S-4		Wet, brown, fine SAND (SP). Wet, brownish gray, coarse SAND, some gravel (SP). Wet, brownish gray, silty, gravelly, fine SAND (SM).			14 13 13	▲26	
				Fraser Undifferentiated					
				Heavy drill chatter, bouncing. Difficult drilling.					
20		S-5		Wet, brownish gray with trace iron oxide staining, very gravelly, slightly silty, medium SAND; occasional large gravel in spoon; interbeds (<1 inch thick) of coarse sand or silt (SP). Difficult drilling continues.			14 21 27	▲48	
25		S-6		Wet, brownish gray, very gravelly, medium SAND, some silt; thin beds (1/2 to 1 inch thick) of coarse sand and silt (SP).			20 26 22	▲48	
				Smoother drilling.					
30		S-7		Wet, gray, fine SAND; massive; grades to medium SAND with gravel at shoe (SP). Difficult drilling.			7 7 7	▲14	
35		S-8		Wet, gray, fine SAND; massive (SP). Wet, brownish gray, sandy, GRAVEL, some silt; clasts of gray silt and brown silt (GP).			11 20 23	▲43	
				Smoother drilling.					

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: NS

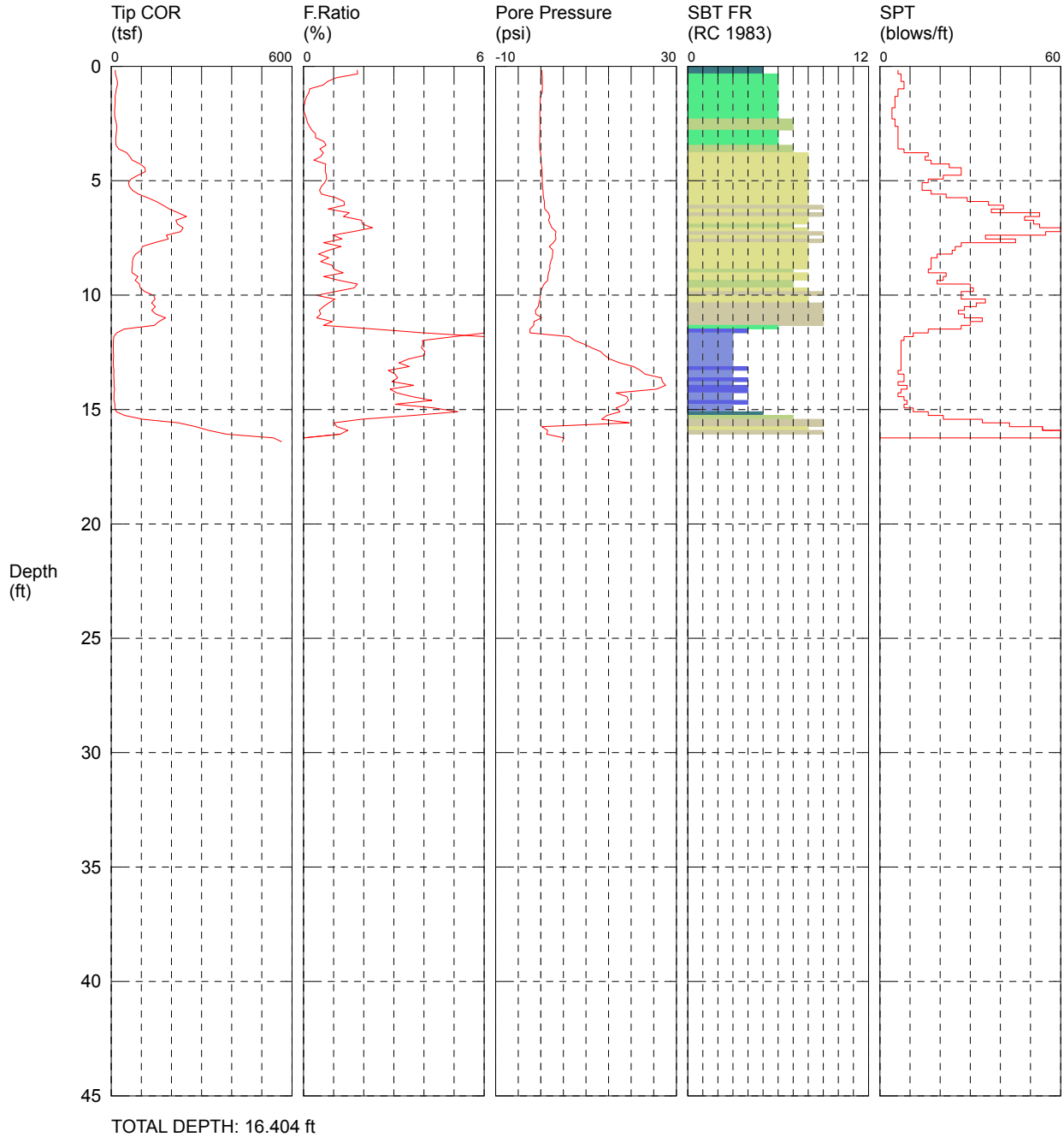
Approved by: CJK

AESIBOR 180066.GPJ June 11, 2018

CPT-06

CPT CONTRACTOR: In Situ Engineering
CUSTOMER: AESI
LOCATION: Issaquah
JOB NUMBER: 180066E001
COMMENT: Issaquah Mid School Admin Site

OPERATOR: Okbay
CONE ID: DDG1263
TEST DATE: 4/23/2018 1:19:59 PM
PRIDRILL: N/A
BACKFILL: Bentonite Chips
SURFACE PATCH: Bentonite Chips



TOTAL DEPTH: 16.404 ft

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

APPENDIX C

Flood Impact Analyses

US Army Corps of Engineers HEC-RAS 6.0.0

NELSON GEOTECHNICAL ASSOCIATES, INC.

HollyStreet2021.rep

HEC-RAS HEC-RAS 6.0.0 May 2021
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Holly Street Existing Conditions - 2021
Project File : HollyStreet2021.prj
Run Date and Time: 9/1/2021 5:16:12 PM

Project in English units

Project Description:
Simple 1D model for a single reach of Issaquah Creek along ISD Holly Street Campus.

PLAN DATA

Plan Title: Plan 01
Plan File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.p01

Geometry Title: ISDGeometry
Geometry File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.g01

Flow Title : Flow
Flow File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.f01

Plan Summary Information:

Number of:	Cross Sections	= 5	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

HollyStreet2021.rep

FLOW DATA

Flow Title: Flow
Flow File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.f01

Flow Data (cfs)

River	Reach	RS	100 Year
Issaquah Creek	ISD Campus	141	4160
Issaquah Creek	ISD Campus	0	4160

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Issaquah Creek	ISD Campus	100 Year	Known WS = 70.29	Known WS = 69.39

GEOMETRY DATA

Geometry Title: ISDGeometry
Geometry File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.g01

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 141

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	69	5	69	6	64	10	63	15	62
29	60	34	60	40	61	46	62	55	63
66	64	86	67						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	10	.035	55	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	55	34	22	6	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.34	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.90	Wt. n-Val.	0.050	0.035
0.050				
W.S. Elev (ft)	70.44	Reach Len. (ft)	34.00	22.00
6.00				

Crit W.S. (ft)		Flow Area (sq ft)	38.87	408.66	175.05
E.G. Slope (ft/ft)	0.002026	Area (sq ft)	38.87	408.66	175.05
Q Total (cfs)	4160.00	Flow (cfs)	95.32	3376.06	688.62
Top Width (ft)	86.00	Top Width (ft)	10.00	45.00	31.00
Vel Total (ft/s)	6.68	Avg. Vel. (ft/s)	2.45	8.26	3.93
Max Chl Dpth (ft)	10.44	Hydr. Depth (ft)	3.89	9.08	5.65
Conv. Total (cfs)	92424.3	Conv. (cfs)	2117.7	75007.2	15299.4
Length Wtd. (ft)	19.60	Wetted Per. (ft)	15.66	45.46	34.71
Min Ch El (ft)	60.00	Shear (lb/sq ft)	0.31	1.14	0.64
Alpha	1.30	Stream Power (lb/ft s)	0.77	9.39	2.51
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.33	1.15	0.51
C & E Loss (ft)	0.09	Cum SA (acres)	0.08	0.12	0.09

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 119

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70	6	70	9	64	13	63	18	61
22	62	27	62	36	60	50	60	57	62
66	63	86	65	93	66	105	67		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	13	.035	66	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	66	27	22	19	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (ft)	70.61	Reach Len. (ft)	27.00	22.00	19.00
Crit W.S. (ft)		Flow Area (sq ft)	42.93	497.82	217.28
E.G. Slope (ft/ft)	0.001326	Area (sq ft)	42.93	497.82	

217.28					
Q Total (cfs)	4160.00	Flow (cfs)	84.68	3381.01	
694.31					
Top Width (ft)	105.00	Top Width (ft)	13.00	53.00	
39.00					
Vel Total (ft/s)	5.49	Avg. Vel. (ft/s)	1.97	6.79	
3.20					
Max Chl Dpth (ft)	10.61	Hydr. Depth (ft)	3.30	9.39	
5.57					
Conv. Total (cfs)	114240.7	Conv. (cfs)	2325.5	92848.3	
19066.9					
Length Wtd. (ft)	21.41	Wetted Per. (ft)	17.44	54.06	
42.82					
Min Ch El (ft)	60.00	Shear (lb/sq ft)	0.20	0.76	
0.42					
Alpha	1.30	Stream Power (lb/ft s)	0.40	5.18	
1.34					
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.30	0.92	
0.48					
C & E Loss (ft)	0.02	Cum SA (acres)	0.07	0.10	
0.08					

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 97

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70	5	70	8	67	14	64	15	63
18	61	21	63	40	62	47	61	49	62
55	63	70	64	87	66	98	66	105	67

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15	.035	55	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
15	55	36	24	21	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.16	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	0.84	Wt. n-Val.	0.045	0.035	
0.045					
W.S. Elev (ft)	70.31	Reach Len. (ft)	36.00	24.00	
21.00					
Crit W.S. (ft)		Flow Area (sq ft)	42.70	324.54	
266.68					
E.G. Slope (ft/ft)	0.002549	Area (sq ft)	42.70	324.54	
266.68					
Q Total (cfs)	4160.00	Flow (cfs)	128.17	2735.11	
1296.73					

Top Width (ft)	105.00	Top Width (ft)	15.00	40.00	50.00
Vel Total (ft/s)	6.56	Avg. Vel. (ft/s)	3.00	8.43	4.86
Max Chl Dpth (ft)	9.31	Hydr. Depth (ft)	2.85	8.11	5.33
Conv. Total (cfs)	82397.8	Conv. (cfs)	2538.6	54174.7	25684.5
Length Wtd. (ft)	24.41	Wetted Per. (ft)	17.68	41.63	53.54
Min Ch El (ft)	61.00	Shear (lb/sq ft)	0.38	1.24	0.79
Alpha	1.26	Stream Power (lb/ft s)	1.15	10.46	3.85
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.28	0.71	0.37
C & E Loss (ft)	0.05	Cum SA (acres)	0.06	0.07	0.06

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 73

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	28	65	35	62	37	60	41	62
42	62	47	60	54	59	64	61	68	62
81	64	86	65	93	66	110	67		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	35	.035	68	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35	68	78	73	62	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.68	Wt. n-Val.	0.040	0.035	0.045
W.S. Elev (ft)	70.38	Reach Len. (ft)	78.00	73.00	62.00
Crit W.S. (ft)		Flow Area (sq ft)	170.64	326.89	225.27
E.G. Slope (ft/ft)	0.001733	Area (sq ft)	170.64	326.89	225.27
Q Total (cfs)	4160.00	Flow (cfs)	705.16	2558.34	896.50
Top Width (ft)	110.00	Top Width (ft)	35.00	33.00	42.00
Vel Total (ft/s)	5.76	Avg. Vel. (ft/s)	4.13	7.83	

3.98					
Max Chl Dpth (ft)	11.38	Hydr. Depth (ft)	4.88	9.91	
5.36					
Conv. Total (cfs)	99933.6	Conv. (cfs)	16939.7	61457.7	
21536.2					
Length Wtd. (ft)	71.37	Wetted Per. (ft)	39.06	35.08	
45.73					
Min Ch El (ft)	59.00	Shear (lb/sq ft)	0.47	1.01	
0.53					
Alpha	1.33	Stream Power (lb/ft s)	1.95	7.89	
2.12					
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.19	0.54	
0.26					
C & E Loss (ft)	0.08	Cum SA (acres)	0.04	0.05	
0.04					

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 0

INPUT
Description: Downstream Cross Section
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	68	5	68	11	60	13	59	15	58
27	58	32	59	40	60	56	62		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	11	.035	40	.045

Bank Sta: Left	Right	Coeff Contr.	Expan.
11	40	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	70.83	Element	Left OB	Channel	
Right OB					
Vel Head (ft)	1.44	Wt. n-Val.	0.035	0.035	
0.045					
W.S. Elev (ft)	69.39	Reach Len. (ft)			
Crit W.S. (ft)	66.15	Flow Area (sq ft)	39.29	311.81	
134.24					
E.G. Slope (ft/ft)	0.002656	Area (sq ft)	39.29	311.81	
134.24					
Q Total (cfs)	4160.00	Flow (cfs)	153.99	3276.25	
729.76					
Top Width (ft)	56.00	Top Width (ft)	11.00	29.00	
16.00					
Vel Total (ft/s)	8.57	Avg. Vel. (ft/s)	3.92	10.51	
5.44					

Max Chl Dpth (ft)	11.39	Hydr. Depth (ft)	3.57	10.75	8.39
Conv. Total (cfs)	80712.4	Conv. (cfs)	2987.8	63565.7	14158.9
Length Wtd. (ft)		Wetted Per. (ft)	16.39	29.63	23.51
Min Ch El (ft)	58.00	Shear (lb/sq ft)	0.40	1.75	0.95
Alpha	1.26	Stream Power (lb/ft s)	1.56	18.34	5.15
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Issaquah Creek

Reach	River Sta.	n1	n2	n3
ISD Campus	141	.05	.035	.05
ISD Campus	119	.05	.035	.05
ISD Campus	97	.045	.035	.045
ISD Campus	73	.04	.035	.045
ISD Campus	0	.035	.035	.045

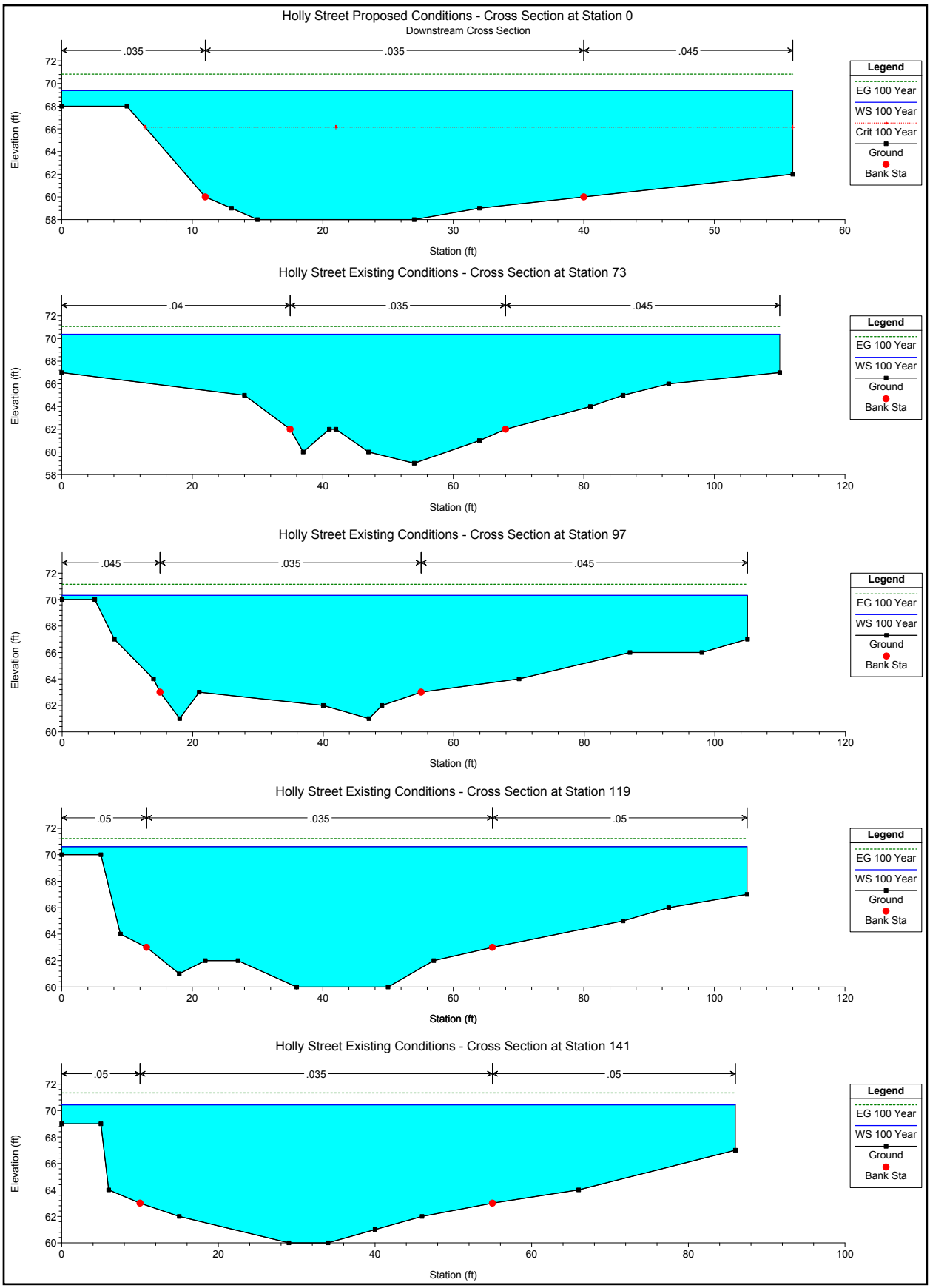
SUMMARY OF REACH LENGTHS

River: Issaquah Creek

Reach	River Sta.	Left	Channel	Right
ISD Campus	141	34	22	6
ISD Campus	119	27	22	19
ISD Campus	97	36	24	21
ISD Campus	73	78	73	62
ISD Campus	0			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Issaquah Creek

Reach	River Sta.	Contr.	Expan.
ISD Campus	141	.1	.3
ISD Campus	119	.1	.3
ISD Campus	97	.1	.3
ISD Campus	73	.1	.3
ISD Campus	0	.1	.3


Holly Street Proposed Conditions - Cross Section at Station 0
Downstream Cross Section
.035
.035
.045
Elevation (ft)
Station (ft)
Legend
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Bank Sta
Holly Street Existing Conditions - Cross Section at Station 73
.04
.035
.045
Elevation (ft)
Station (ft)
Legend
EG 100 Year
WS 100 Year
Ground
Bank Sta
Holly Street Existing Conditions - Cross Section at Station 97
.045
.035
.045
Elevation (ft)
Station (ft)
Legend
EG 100 Year
WS 100 Year
Ground
Bank Sta
Holly Street Existing Conditions - Cross Section at Station 119
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 100 Year
WS 100 Year
Ground
Bank Sta
Holly Street Existing Conditions - Cross Section at Station 141
.05
.035
.05
Elevation (ft)
Station (ft)
Legend
EG 100 Year
WS 100 Year
Ground
Bank Sta

HollyStreet2021.rep

HEC-RAS HEC-RAS 6.0.0 May 2021
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Holly Street Proposed Conditions
Project File : HollyStreet2021.prj
Run Date and Time: 9/8/2021 9:34:24 AM

Project in English units

Project Description:
Simple 1D model for a single reach of Issaquah Creek along ISD Holly Street Campus with proposed bank reconstruction from a 2019-2020 flood event.

PLAN DATA

Plan Title: Plan 02
Plan File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.p02

Geometry Title: ISDGeometry (Proposed Conditions)
Geometry File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.g01

Flow Title : Flow
Flow File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.f01

Plan Summary Information:

Number of:	Cross Sections	= 5	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

HollyStreet2021.rep

FLOW DATA

Flow Title: Flow
Flow File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.f01

Flow Data (cfs)

River	Reach	RS	100 Year
Issaquah Creek	ISD Campus	141	4160
Issaquah Creek	ISD Campus	0	4160

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Issaquah Creek	ISD Campus	100 Year	Known WS = 70.29	Known WS = 69.39

GEOMETRY DATA

Geometry Title: ISDGeometry
Geometry File : c:\Users\carstonc\Documents\HEC-RAS\HollyStreet2021.g01

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 141

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	69	5	69	6	64	10	63	15	62
29	60	34	60	40	61	46	62	55	63
66	64	86	67						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	10	.035	55	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	55	34	22	6	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.37	Element	Left OB	Channel
Vel Head (ft)	0.89	Wt. n-Val.	0.050	0.035
W.S. Elev (ft)	70.48	Reach Len. (ft)	34.00	22.00

Right OB
0.050
6.00

Crit W.S. (ft)		Flow Area (sq ft)	39.33	410.74	176.48
E.G. Slope (ft/ft)	0.001988	Area (sq ft)	39.33	410.74	176.48
Q Total (cfs)	4160.00	Flow (cfs)	96.12	3372.97	690.91
Top Width (ft)	86.00	Top Width (ft)	10.00	45.00	31.00
Vel Total (ft/s)	6.64	Avg. Vel. (ft/s)	2.44	8.21	3.92
Max Chl Dpth (ft)	10.48	Hydr. Depth (ft)	3.93	9.13	5.69
Conv. Total (cfs)	93294.5	Conv. (cfs)	2155.6	75644.1	15494.8
Length Wtd. (ft)	19.04	Wetted Per. (ft)	15.71	45.46	34.75
Min Ch El (ft)	60.00	Shear (lb/sq ft)	0.31	1.12	0.63
Alpha	1.30	Stream Power (lb/ft s)	0.76	9.21	2.47
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.27	1.04	0.50
C & E Loss (ft)	0.03	Cum SA (acres)	0.08	0.12	0.09

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 119

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70	6	70	9	64	13	63	18	61
22	62	27	62	36	60	50	60	57	62
66	63	86	65	93	66	105	67		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	13	.035	66	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
13	66	27	22	19	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	27	68

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.	0.050	0.035	0.050
W.S. Elev (ft)	70.51	Reach Len. (ft)	27.00	22.00	19.00

Crit W.S. (ft)		Flow Area (sq ft)	19.59	406.38	213.28
E.G. Slope (ft/ft)	0.002619	Area (sq ft)	19.59	406.38	213.28
Q Total (cfs)	4160.00	Flow (cfs)	36.02	3176.45	947.53
Top Width (ft)	105.00	Top Width (ft)	13.00	53.00	39.00
Vel Total (ft/s)	6.51	Avg. Vel. (ft/s)	1.84	7.82	4.44
Max Chl Dpth (ft)	10.51	Hydr. Depth (ft)	1.51	7.67	5.47
Conv. Total (cfs)	81286.6	Conv. (cfs)	703.8	62067.9	18514.9
Length Wtd. (ft)	21.14	Wetted Per. (ft)	14.74	59.56	42.72
Min Ch El (ft)	60.00	Shear (lb/sq ft)	0.22	1.12	0.82
Alpha	1.21	Stream Power (lb/ft s)	0.40	8.72	3.63
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.24	0.84	0.47
C & E Loss (ft)	0.02	Cum SA (acres)	0.07	0.10	0.08

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 97

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70	5	70	8	67	14	64	15	63
18	61	21	63	40	62	47	61	49	62
55	63	70	64	87	66	98	66	105	67

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	15	.035	55	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
15	55	36	24	21	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	22	68

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.98	Wt. n-Val.	0.045	0.035	0.045
W.S. Elev (ft)	70.24	Reach Len. (ft)	36.00	24.00	21.00

Crit W.S. (ft)		Flow Area (sq ft)	21.57	280.49	262.90
E.G. Slope (ft/ft)	0.003970	Area (sq ft)	21.57	280.49	262.90
Q Total (cfs)	4160.00	Flow (cfs)	54.61	2523.70	1581.69
Top Width (ft)	105.00	Top Width (ft)	15.00	40.00	50.00
Vel Total (ft/s)	7.36	Avg. Vel. (ft/s)	2.53	9.00	6.02
Max Chl Dpth (ft)	9.24	Hydr. Depth (ft)	1.44	7.01	5.26
Conv. Total (cfs)	66026.3	Conv. (cfs)	866.8	40055.4	25104.1
Length Wtd. (ft)	24.06	Wetted Per. (ft)	16.07	45.47	53.46
Min Ch El (ft)	61.00	Shear (lb/sq ft)	0.33	1.53	1.22
Alpha	1.16	Stream Power (lb/ft s)	0.84	13.76	7.33
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.23	0.66	0.37
C & E Loss (ft)	0.06	Cum SA (acres)	0.06	0.07	0.06

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 73

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	67	28	65	35	62	37	60	41	62
42	62	47	60	54	59	64	61	68	62
81	64	86	65	93	66	110	67		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	35	.035	68	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35	68	78	73	62	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	42	66

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	71.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.	0.040	0.035	0.045
W.S. Elev (ft)	70.30	Reach Len. (ft)	78.00	73.00	62.00

Crit W.S. (ft)		Flow Area (sq ft)	143.37	290.27	221.94
E.G. Slope (ft/ft)	0.002583	Area (sq ft)	143.37	290.27	221.94
Q Total (cfs)	4160.00	Flow (cfs)	652.19	2438.86	1068.95
Top Width (ft)	110.00	Top Width (ft)	35.00	33.00	42.00
Vel Total (ft/s)	6.35	Avg. Vel. (ft/s)	4.55	8.40	4.82
Max Chl Dpth (ft)	11.30	Hydr. Depth (ft)	4.10	8.80	5.28
Conv. Total (cfs)	81851.2	Conv. (cfs)	12832.4	47986.5	21032.4
Length Wtd. (ft)	71.11	Wetted Per. (ft)	38.33	37.78	45.65
Min Ch El (ft)	59.00	Shear (lb/sq ft)	0.60	1.24	0.78
Alpha	1.26	Stream Power (lb/ft s)	2.74	10.41	3.78
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.16	0.50	0.25
C & E Loss (ft)	0.07	Cum SA (acres)	0.04	0.05	0.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Issaquah Creek
REACH: ISD Campus RS: 0

INPUT
Description: Downstream Cross Section
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	68	5	68	11	60	13	59	15	58
27	58	32	59	40	60	56	62		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	11	.035	40	.045

Bank Sta: Left	Right	Coeff Contr.	Expan.
11	40	.1	.3

CROSS SECTION OUTPUT Profile #100 Year

E.G. Elev (ft)	70.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.44	Wt. n-Val.	0.035	0.035	0.045
W.S. Elev (ft)	69.39	Reach Len. (ft)			
Crit W.S. (ft)	66.15	Flow Area (sq ft)	39.29	311.81	

134.24					
E.G. Slope (ft/ft)	0.002656	Area (sq ft)	39.29	311.81	
134.24					
Q Total (cfs)	4160.00	Flow (cfs)	153.99	3276.25	
729.76					
Top Width (ft)	56.00	Top Width (ft)	11.00	29.00	
16.00					
Vel Total (ft/s)	8.57	Avg. Vel. (ft/s)	3.92	10.51	
5.44					
Max Chl Dpth (ft)	11.39	Hydr. Depth (ft)	3.57	10.75	
8.39					
Conv. Total (cfs)	80712.4	Conv. (cfs)	2987.8	63565.7	
14158.9					
Length Wtd. (ft)		Wetted Per. (ft)	16.39	29.63	
23.51					
Min Ch El (ft)	58.00	Shear (lb/sq ft)	0.40	1.75	
0.95					
Alpha	1.26	Stream Power (lb/ft s)	1.56	18.34	
5.15					
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Issaquah Creek

Reach	River Sta.	n1	n2	n3
ISD Campus	141	.05	.035	.05
ISD Campus	119	.05	.035	.05
ISD Campus	97	.045	.035	.045
ISD Campus	73	.04	.035	.045
ISD Campus	0	.035	.035	.045

SUMMARY OF REACH LENGTHS

River: Issaquah Creek

Reach	River Sta.	Left	Channel	Right
ISD Campus	141	34	22	6
ISD Campus	119	27	22	19
ISD Campus	97	36	24	21
ISD Campus	73	78	73	62
ISD Campus	0			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Issaquah Creek

Reach	River Sta.	Contr.	Expan.

ISD Campus	141	.1	.3
ISD Campus	119	.1	.3
ISD Campus	97	.1	.3
ISD Campus	73	.1	.3
ISD Campus	0	.1	.3

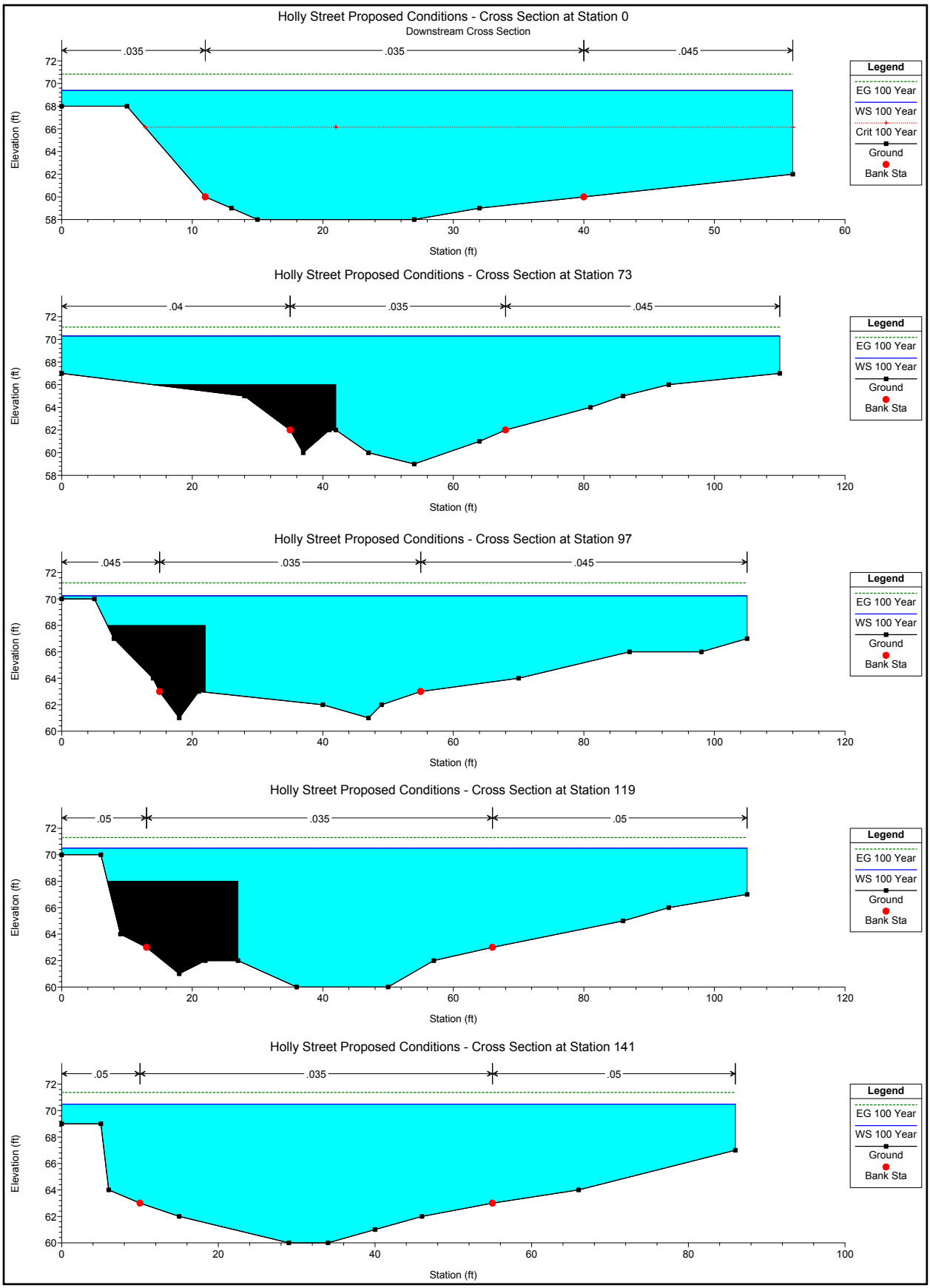

Holly Street Proposed Conditions - Cross Section at Station 0
Downstream Cross Section
.035
.035
.045
Legend
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
Holly Street Proposed Conditions - Cross Section at Station 73
.04
.035
.045
Holly Street Proposed Conditions - Cross Section at Station 97
.045
.035
.045
Holly Street Proposed Conditions - Cross Section at Station 119
.05
.035
.05
Holly Street Proposed Conditions - Cross Section at Station 141
.05
.035
.05

Exhibit 6

CRITICAL AREA STUDY AND BUFFER MITIGATION

FOR

ISSAQUAH CREEK BANK EROSION REPAIR

ISSAQUAH, WA

Wetland Resources, Inc. Project #21034

Prepared By
Wetland Resources, Inc.
9505 19th Avenue SE, Suite 106
Everett, WA 98208
(425) 337-3174

Prepared For
Issaquah School District #411
Attn: Janelle Walker
5150 220th Ave SE
Issaquah, WA 98029

November 2, 2021

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1.0 INTRODUCTION

During the winter of 2019-2020, during a period of unusually heavy, prolonged rain, Issaquah Creek experienced extensive erosion of its west bank along the eastern boundary of the Issaquah School District's property at 565 Northwest Holly Street. Wetland Resources, Inc. (WRI) conducted site visits in February and March 2020 to assess the bank erosion from recent flooding of Issaquah Creek and to locate wetlands and streams occurring within and near the project area. The site investigations were limited to the east side of the property, as shown on Sheet 1 in Appendix B. Figures 1 and 2 show the portion of stream bank before and after the erosion event.

Figure 1 - Issaquah Creek bank in May 2018 (Image source: Google Maps).

Figure 2 - Issaquah Creek bank damage from flooding. Photo from March 2021.

An initial geotechnical assessment performed by Associated Earth Sciences, Inc. (*Geotechnical Design Recommendations – Issaquah Creek Bank Erosion Repair*, dated July 9, 2020) determined that unless stabilized, the channel erosion would continue to encroach into the District's property. Further erosion would cause damage to existing infrastructure and posed a safety hazard. Temporary, emergency stabilization measures were installed in March 2021 and consist of steel sheet piles and super sacks. Several additional site visits were conducted by WRI between March 2020 and October 2021 to assist with installation of the temporary stabilization and assess site conditions.

Figure 3 - Temporary bank stabilization measures, installed March 2021.

In order to avoid further erosion of the creek bank, the temporary stabilization will be removed as part of the construction of the proposed permanent stabilization project. The current proposed project is for installation of more comprehensive, permanent stabilization measures consistent with bioengineering techniques required by multiple agencies and the City of Issaquah.

The purpose of this report is to provide information on the proposed permanent bank repair project and compliance with Issaquah Municipal Code and Shoreline Master Program. This report is specific to regulations for wetlands, streams, and Shoreline Jurisdiction. Information on other critical areas is not included in this report. A Floodplain Habitat Assessment and geotechnical report have been prepared for this project.

1.1 SITE DESCRIPTION

The subject site is a 19.31-acre parcel located at 565 Northwest Holly Street, in the city of Issaquah, Washington, (parcel number: 2824069012) within a portion of Section 28, Township 24N, Range 6E, W.M. The site is located in the Issaquah Creek drainage basin within the Cedar-Sammamish Watershed; Water Resources Inventory Area 8. Two access points to the subject site exist. One is located along the western property line along Newport Way Northwest and the second is located along the northern property line along Northwest Holly Street.

Surrounding land use consists primarily of high-density single and multi-family residential development. This site is currently developed with Issaquah Valley Elementary School in the western portion, Dodd Fields Park in the south-central portion, and an Issaquah School District administration building in the eastern portion. Issaquah Creek is located along the eastern property boundary. The shoreline designation associated with Issaquah Creek in this area is 'Issaquah Creek Urban Conservancy Shoreline Environment." The FEMA preliminary 100-year floodplain and preliminary floodway of Issaquah Creek are mapped along the eastern property line, extending onto the subject site (King County iMap).

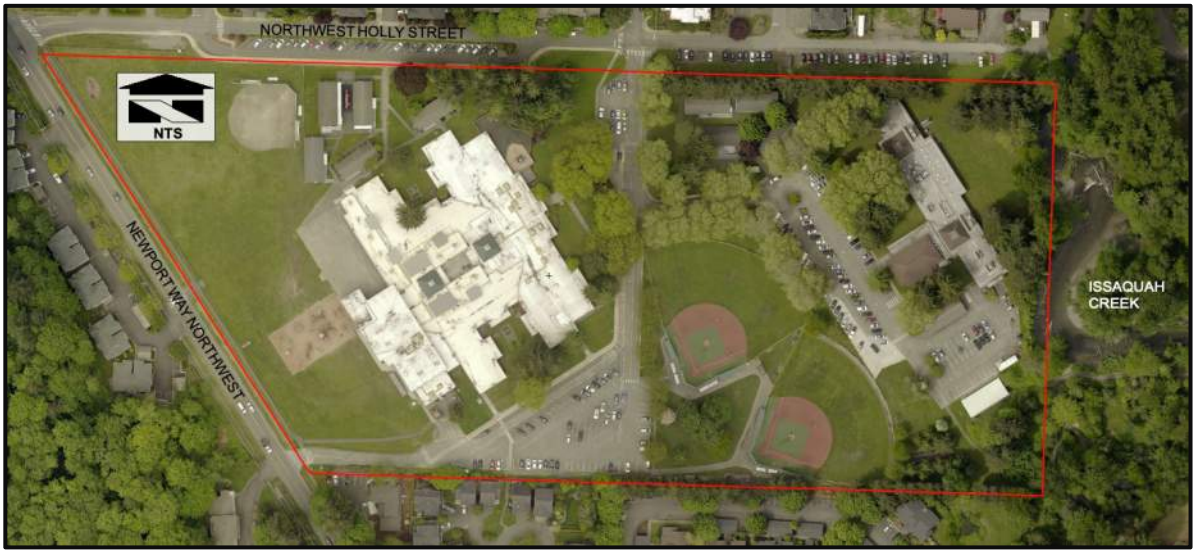

Figure 4 - Aerial view of subject property.

Topography on the site is relatively flat with a slight slope to the east toward Issaquah Creek. Adjacent to the stream, topography drops steeply to the east. The majority of the property is developed with buildings and fields and has limited native vegetation. However, a few portions of the site contain forested areas with shrubs and groundcover in the understory. The forested areas along the northern and eastern edges of the property are primarily vegetated with native species, with some Himalayan blackberry and other invasive species along the eastern side of the property. Confluence Park is located to the east of the subject site.

2.0 REVIEW OF EXISTING INFORMATION

Prior to conducting the initial site investigation, public resource information was reviewed to gather background information on the subject property and the surrounding area in regards to wetlands, streams, and other critical areas.

- USDA/NRCS Web Soil Survey: The majority of the site is predicted to have Briscot silt loam.

- King County iMap: This resource does not map any wetlands on site. Issaquah Creek is mapped along the eastern property line as a Class 1 waterbody (shoreline of the state). The northeastern and eastern areas of the property are mapped within the FEMA preliminary

100-year floodplain. A small portion of the northeastern area is mapped as FEMA preliminary floodway.

- Washington Department of Fish and Wildlife (WDFW) SalmonScape Interactive Mapping System: This public resource confirms that salmon use Issaquah Creek. Issaquah Creek is documented as spawning area for fall Chinook (*Oncorhynchus tschawytscha*), Coho (*Oncorhynchus kisutch*), winter Steelhead (*Oncorhynchus mykiss*), Sockeye (*Oncorhynchus nerka*), and has documented presence of Kokanee (*Oncorhynchus nerka*).

- WDFW Priority Habitat and Species (PHS) Interactive Map: This resource maps the subject property within a township that contains Yuma myotis (*Myotis yumanensis*), big brown bat (*Eptesicus fuscus*), and little brown bat (*Myotis lucifugus*) breeding areas and Townsend's big-eared bat (*Corynorhinus townsendii*) communal roost area. Issaquah Creek is mapped as a breeding area for fall Chinook, winter Steelhead, Sockeye, and Coho and has documented presence of Resident Coastal Cutthroat and Kokanee.

- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory: This resource maps Issaquah Creek as a Riverine, Upper Perennial, Unconsolidated Bottom, Permanently flooded feature. A tributary of Issaquah Creek is mapped along the northern property boundary as a Riverine, Intermittent, Streambed, Seasonally Flooded feature. The tributary is shown extending to the west of the subject site.

- Washington Department of Natural Resources Forest Practices Application Mapping Tool (FPAMT): This public resource identifies Issaquah Creek as a Type S (fish-bearing). A tributary to Issaquah Creek is mapped along the northern property line. This tributary is mapped as Type F for a distance of approximately 450 feet upstream (west) from Issaquah Creek and Type N upstream from there.

- WDNR Wetlands of High Conservation Value interactive map: No resources are depicted on or in the vicinity of the subject site.

3.0 WETLAND & STREAM DETERMINATION REPORT

3.1 METHODOLOGY

The ordinary high water mark (OHWM) of streams is determined using the methodology described in the Washington Department of Ecology's publication, *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State* (Anderson, et al. 2016).

Wetland boundaries in western Washington are determined using the routine methodology described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountians, Valleys, and Coast Region (Version 2.0)* (U.S. Army Corps of Engineers 2010). Under the routine methodology, the process for making a wetland determination is based on three steps:

1.) Examination of the site for hydrophytic vegetation (species present and percent cover);
2.) Examination of the site for hydric soils;
3.) Determining the presence of wetland hydrology

The following criteria must be met in order to make a positive wetland determination:

Vegetation Criteria
The Corps Manual and 2010 Regional Supplement define hydrophytic vegetation as "*the assemblage of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to influence plant occurrence.*" Field indicators are used to determine whether the hydrophytic vegetation criteria have been met. Examples of these indicators include, but are not limited to, the rapid test for hydrophytic vegetation, a dominance test result of greater than 50%, and/or a prevalence index score less than or equal to 3.0.

Soils Criteria and Mapped Description
The 2010 Regional Supplement (per the National Technical Committee for Hydric Soils) defines hydric soils as soils *"that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part."* Field indicators are used to determine whether a given soil meets the definition for hydric soils. Indicators are numerous and include, but are not limited to, presence of a histosol or histic epipedon, a sandy gleyed matrix, depleted matrix, and redoximorphic depressions.

According to NRCS Web Soil Survey, the soil map unit Briscot silt loam is predicted to occur on the subject property.

Briscot loam is described as very deep, poorly drained soil formed in recent alluvium on floodplains. Slopes are generally 0 to 2 percent. These soils are usually moist and contain irregular distribution of organic matter. Typical surface layers are dark grayish brown or grayish brown silt loam to about 9 inches deep. The subsoil (9 to 17 inches) is typically grayish brown or light brownish gray silt loam with large and prominent dark brown redox concentrations. These soils are poorly drained with very slow runoff, and are moderately permeable. This soil is described as hydric.

Hydrology Criteria
The 2010 Regional Supplement defines wetland hydrology as "*areas that are inundated (flooded or ponded) or the water table is less than or equal to 12 inches below the soil surface for 14 or more consecutive days during the growing season at a minimum frequency of 5 years in 10*." During the early growing season, wetland hydrology determinations are made based on physical observation of surface water, a high water table, or saturation in the upper 12 inches. Outside of the early growing season, wetland hydrology determinations are made based on physical evidence of recent inundation or saturation (i.e. water marks, surface soil cracks, water-stained leaves).

3.2 BOUNDARY DETERMINATION FINDINGS

No wetlands were identified within the investigation area. Issaquah Creek flows along the eastern property boundary. Issaquah Creek was classified according to the Cowardin System, as described in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin 1979), and under Chapter 18.10 of the Issaquah Municipal Code (IMC).

3.2.1 Wetland Determination

Vegetation within the investigation area consists of maintained lawn, landscaping, and forested area along Issaquah Creek. Vegetation bordering the stream includes Douglas fir (*Pseudotsuga menziesii*), big leaf maple (*Acer macrophyllum*), beaked hazelnut (*Corylus cornuta*), Himalayan blackberry (*Rubus armeniacus*), dull Oregon grape (*Mahonia nervosa*), and sword fern (*Polystichum munitum*). Soils in the investigation area are typically very dark brown (10YR 2/2) in the upper layer and dark brown (10YR 3/3) in the sublayer. Soils are generally a sandy loam texture throughout the profile. Soils were moist during the March 2020 site visit. No indications of prolonged inundation, saturation, or high water table were observed outside of the ordinary high water mark of Issaquah Creek. Dominant vegetation communities were distinctly upland, soils do not meet hydric indicators, and evidence of wetland hydrology was not observed within 12 inches of the ground surface. The conditions within the investigation area do not meet the criteria for wetlands as described above.

3.2.2 Issaquah Creek

Cowardin Classification: Riverine, Upper Perennial, Unconsolidated Bottom, Cobble-Gravel
City of Issaquah Classification: Class 1
City of Issaquah Buffer: 100 feet

Issaquah Creek is a Shoreline of the State (Class 1) per WAC section 222-16-030 and IMC 18.10.780. Class 1 waterbodies in the City of Issaquah typically receive 100-foot buffers (IMC 18.10.785). This waterbody flows north into Lake Sammamish and is documented as supporting a variety of salmonid species including Chinook, Steelhead, resident Coastal Cutthroat, Sockeye, Coho, and Kokanee. The Shoreline management area within the subject property is designated as Issaquah Creek Urban Conservancy Shoreline Environment Designation. The historic ordinary high water mark (prior to the recent erosion event) and the current ordinary high water mark of Issaquah Creek are depicted on the Existing Conditions and Proposed Streambank Repair Map (Appendix B).

3.2.3 Special Flood Hazard Areas

The FEMA preliminary 100-year floodplain and preliminary floodway of Issaquah Creek are mapped along the eastern property line, extending onto the subject site (King County iMap). The extent of these areas is depicted on the Existing Conditions Map (Appendix B). Work will take place within the 100-year floodplain and a small portion of the project will take place within the mapped floodway. A separate Floodplain Habitat Assessment report has been prepared to address the work within the floodplain.

4.0 PROJECT DESCRIPTION

The permanent stabilization project will consist of installing streambank protection along approximately 130 feet of cutbank on the west side of Issaquah Creek. Protection will include reconstruction of a portion of the bank lost to channel erosion in proximity to Issaquah School District infrastructure with an engineered, non-deformable 'log toe' incorporating large woody debris and habitat boulders. The log toe will provide protection against the erosive forces directed toward the bank, and provide valuable fish habitat. Habitat boulders will anchor the large woody debris for normal and moderately-high flow flood stages of the stream. Mechanical anchors are included in the design as a supplemental security measure. The woody debris will be situated such that the future possible effects of channel scour are mitigated as much as four feet below the existing channel bottom. Native plants will be installed within the jute soil bags at the top of the stabilization structure, adjacent to the existing parking lot. As the bioengineered structure decays, revegetation within the reconstructed bank will take hold and form permanent, long-term stabilization.

Construction of the stream bank stabilization measures will include work within the ordinary high-water mark of Issaquah Creek, the 100-year floodplain, and a small portion of the mapped floodway. To facilitate work within the stream and reduce impacts associated with construction, fish will be removed from the work area and a temporary coffer dam will be installed along the perimeter to isolate the work area for the duration of construction. All in-water work will be performed between July 1st and August 30th, the approved fish window. Fish exclusion protocol is included in Appendix A.

Impacts to vegetation associated with the project includes removal of eight trees. These trees were recommended for removal in the *Tree Risk Assessment* prepared by Washington Forestry Consultants, Inc. as the erosion has already moved into the critical root zone for the trees. Vegetation in the understory in this area contains bamboo, English ivy (*Hedera helix*), and other invasive species. As mitigation for removal of the trees, additional trees will be installed and 5,515 square feet of stream buffer immediately adjacent to Issaquah Creek will be restored through removal of invasive species and installation of native plants. Details of the Buffer Restoration Plan are provided below in Section 4.4.

4.1 ISSAQUAH MUNICIPAL CODE 18.10.775 ALTERATIONS TO STREAMS AND BUFFERS

Stream Channel Stabilization: Stream channels may be stabilized when movement of the stream channel threatens existing residential or commercial structures, public improvements, unique natural resources, or the only existing access to property, and when stabilization is done in accordance with the requirements in IMC 18.10.530 and the administrative rules.

As discussed in the *Geotechnical and Engineering Geologic Hazard Evaluation* by Nelson Geotechnical Associates, Inc, without stabilization measures the bank will continue to erode. Continued erosion will undermine the parking lot, which would negatively affect the water quality and habitat within Issaquah Creek.

This project meets the requirements of IMC 16.36. A separate Floodplain Habitat Assessment has been prepared to address those requirements.

4.2 MITIGATION SEQUENCING

Per IMC 18.10.490, all development on sites with critical areas must demonstrate mitigation sequencing was followed while designing the project. The mitigation sequence text from IMC is listed below in italics, with WRI discussion following.

1. *Avoid impacts altogether by not taking a certain action or parts of an action;*

While there are temporary stabilization measures currently in place, these measures are not adequate for long-term bank stabilization. The temporary measures do not adequately protect the site from scour at the toe of the bank or velocity of water along this section of the stream channel. Without the installation of permanent stabilization measures, the bank will continue to erode. Further erosion will jeopardize the existing infrastructure on the site. The geotechnical assessment for the project includes a scour analysis as well as flow and sediment transport analysis based on the USACE Hydrologic Engineering Center's River Analysis System. The current OHWM is only about 7 feet from the edge of the parking lot. Per the geotechnical evaluation, this is not enough space to provide stabilization measures that account of the scour at the toe of the bank or velocity of water along the meander. In order to install effective, permanent bank stabilization measures, work within the OHWM, floodplain, floodway, and stream buffer areas is unavoidable.

2. *Minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;*

All in-stream work will occur between July 1 and August 31, the approved work window for Issaquah Creek and during low-flow season. Temporary Erosion and Sediment Control measures will be in place prior to beginning work and a temporary cofferdam will be installed to isolate work area. All water collected within the work area will be pumped to a sediment tank. This will be used to treat surface water prior to releasing back into the creek. This project will minimize impacts associated with construction by performing work within the dry season, isolating the work area, and maintaining the water quality and hydrology of the stream.

The proposed design incorporates structural and bioengineered elements in order to provide effective, permanent stabilization measures. Habitat boulders, large woody debris, and native vegetation plantings will provide important features for fish habitat and minimize impacts to the existing aquatic habitat. The project design reflects the minimum length and area necessary to provide protection from scour along the toe of the eroded bank or withstand the velocity of water moving through this area long-term.

3. *Rectify impacts by repairing, rehabilitating or restoring the affected environment;*

Buffer restoration plantings are proposed in two areas within the buffer of Issaquah Creek. This will create a vegetated corridor along the stream and provide valuable wildlife habitat. The large woody debris incorporated into the stabilization measures provide important features for fish habitat.

4. Compensate for the impact by replacing, restoring, creating, enhancing or providing substitute resources or environments;

Mitigation for vegetation impacts will be provided through buffer restoration. The buffer planting plan will restore vegetation within the tree removal area, remove invasive species and install native plants in an additional 1,700 square feet of buffer area, and include installation of additional trees in the stream buffer.

5. Monitor the impact and the compensation projects and taking appropriate corrective measures.

The buffer restoration plantings will be monitored for five years, as discussed in Section 6. The *Geotechnical and Engineering Geologic Hazard Evaluation* recommends monitoring of the stabilization measures during both low-flow and high-flow events for five years.

4.3 ECOLOGICAL FUNCTIONS ASSESSMENT

Temporary stabilization measures are currently in place and consist of steel sheets and cobble-filled super sacks installed above the OHWM of Issaquah Creek. Vegetation within the stream buffer in this area consists of English ivy, Himalayan blackberry, thistle, and various grasses.

Figure 5 -Temporary stabilization measures, October 2021.

The temporary measures provide some protection of the aquatic habitat, but they are not adequate for long-term stabilization. The steel plates are not set deep enough to provide protection from scour along the toe of the eroded bank. If no action is taken, further erosion will undermine the existing infrastructure and the temporary stabilization. This will have a negative effect on fish habitat within Issaquah Creek.

The proposed permanent bank stabilization includes rounded habitat boulders, large pieces of wood (including rootballs), and native vegetation plantings along the edge of Issaquah Creek. The proposed stabilization project will enhance the terrestrial habitat through removal of invasive

species and installation of native plants. These plantings will provide native food sources, areas of refuge, shading of the stream channel, and opportunity for large woody debris recruitment. Large woody debris will add complexity to existing fish habitat and offer juvenile fish places to hide with protection from high velocity flows. The proposed bank stabilization measures will provide more diverse in-stream habitat, increasing the functions and values of habitat in this section of Issaquah Creek.

4.4 SHORELINE MASTER PROGRAM COMPLIANCE

Pursuant to the City of Issaquah's Shoreline Master Program (SMP), new shoreline stabilization measures are allowed within Shoreline Jurisdiction if the proposed project meets certain criteria. Policies for shoreline stabilization are in Chapter 5 (5.12) and regulations are in Chapters 6 (6.1.4) and 7 (7.1.3) of the SMP. A detailed analysis of compliance with those sections of the SMP is provided in the Shoreline Narrative for this project, included in the application for the Shoreline Substantial Development permit. A summary of compliance with the policies and regulations regarding stabilization is provided below.

- A geotechnical assessment has determined the permanent bank stabilization project is necessary to protect the buildings and infrastructure on the Issaquah School District property.
- Per the geotechnical evaluation, there is not enough space between existing infrastructure and the OHWM to provide effective permanent stabilization measures outside of the OHWM. Work within the OHWM and stream buffer areas are unavoidable.
- The proposed stabilization measures cover the minimum length of shoreline and area necessary to install permanent protection from scour along the toe of the eroded bank and withstand the velocity of water moving through the stream.
- The proposed permanent bank stabilization combines bioengineered and structural elements. The design includes rounded habitat boulders, large pieces of wood (including rootballs), and native vegetation plantings along the edge of Issaquah Creek.
- The proposed stabilization project will enhance the terrestrial habitat through removal of invasive species and installation of native plants. Existing fish habitat will be protected and enhanced through installation of large woody debris within the channel.

4.5 BUFFER MITIGATION PLAN

A total of eight trees will be removed for the bank stabilization project. These trees were recommended for removal in the Tree Risk Assessment prepared by Washington Forestry Consultants, Inc. as the erosion has already moved into the critical root zone for the trees. Understory vegetation within the location of these trees is minimal and contains bamboo, a significant amount of English ivy (*Hedera helix*), and other invasive species.

Two areas of buffer restoration plantings are proposed as part of this project. Buffer Restoration Area A includes the area immediately adjacent to the bank stabilization measures and where trees will be removed. Buffer Restoration Area B is located to the north of Area A. Buffer Restoration Area C is an area of lawn that will be temporarily impacted during construction.

4.5.1 Buffer Restoration Area A Planting Plan

Prior to installation of plants in this area, all English ivy, bamboo, and other invasive species will be removed. Except for the eight trees scheduled for removal, all other native vegetation will be retained. Trees are not proposed in this area due to proximity of the existing administration building. Sword fern should be planted in partial to full shade.

Buffer Restoration Area A (5,515 square feet)

Common Name	Latin Name	Size	Spacing	Quantity
Hooker's willow	*Salix hookeriana*	live stake	3'	50*
Sitka willow	*Salix sitchensis*	live stake	3'	50*
Red osier dogwood	*Cornus sericea*	1 gal	5'	50*
Western hazelnut	*Corylus cornuta*	1 gallon	5'	28
Oceanspray	*Holodiscus discolor*	1 gallon	5'	28
Red elderberry	*Sambucus racemosa*	1 gallon	5'	28
Salmonberry	*Rubus spectabilis*	1 gallon	5'	28
Snowberry	*Symphoricarpos albus*	1 gallon	5'	28
Sword fern	*Polystichum munitum*	1 gallon	5'	28

*Willows and dogwood will be installed within and adjacent to the jute soil logs and/or close to the stream.

4.5.2 Buffer Restoration Area B Planting Plan

This area is primarily maintained lawn adjacent to established vegetation. Any invasive species present will be removed, and any native vegetation will be retained. Cedar trees should be planted in areas with partial shade. Trees will be spaced

Buffer Restoration Area B (~3,500 square feet)

Common Name	Latin Name	Size	Spacing	Quantity
Douglas fir	*Pseudotsuga menziesii*	2 gallon	15'	8
Western red cedar	*Thuja plicata*	2 gallon	15'	4
Big leaf maple	*Acer macrophyllum*	2 gallon	15'	4

4.5.3 Buffer Restoration Area C

This area is approximately 735 square feet in size and is existing lawn. No ground disturbance is proposed for this area, but it is within the project work area and will be used to access the bank of Issaquah Creek during construction. If vegetation in this area is significantly disturbed, this area will be re-seeded after construction is completed.

5.0 BUFFER RESTORATION PROJECT NOTES

Pre-Construction Meeting
Mitigation projects are typically more complex to install than to describe in plans. Careful monitoring by the project's ecologist for all portions of this project is strongly recommended. Construction timing and sequencing is important to the success of this type of project. There will be a pre-construction meeting on this site between the Permittee, the project's ecologist, and laborers. The objective will be to verify the location of erosion control facilities, verify the location of mitigation areas, and to discuss project sequencing.

Inspections
The project's ecologist shall be contracted to periodically inspect the mitigation installation described in this plan. Minor adjustments to the original design may be necessary prior to and during construction due to unusual or hidden site conditions. A City of Issaquah representative and/or the consulting professional will make these decisions during construction.

5.1 PLANTING NOTES

Plant in the early spring or fall and obtain all plants from a reputable nursery. Care and handling of all plant materials is extremely important to the overall success of the project. The origin of all plant materials specified in this plan shall be native plants, nursery grown in the Puget Sound region of Washington. Some limited species substitutions may be allowed, only with the agreement of the project's ecologist and/or City staff.

Pre-Planting Meeting
Prior to control of invasive species or installation of mitigation plantings, a site meeting between the contracted landscaper and the project's ecologist shall occur to resolve any questions that may arise. During this meeting a discussion regarding plant spacing and locations of plant species including wetland verses buffer species shall occur between the landscape contractor and the project's ecologist.

Handling
Plants shall be handled to avoid all damage, including breaking, bruising, root damage, sunburn, drying, freezing or other injury. Plants must be covered during transport. Plants shall not be bound with wire or rope in a manner that could damage branches. Protect plant roots with shade and wet soil in the time period between delivery and installation. Do not lift container stock by trunks, stems, or tops. Do not remove from containers until ready to plant. Water all plants as necessary to keep moisture levels appropriate to the species horticultural requirements. Plants shall not be allowed to dry out. All plants shall be watered thoroughly immediately upon installation. Soak all containerized plants thoroughly prior to installation. Roots must be covered at all times with mud and/or wet straw, moss, or other suitable packing material until time of installation. Plants whose roots have dried out from exposure will not be accepted at installation inspection.

Storage
Plants stored by the Permittee for longer than one month prior to planting shall be planted in nursery rows and treated in a manner suitable to those species' horticultural requirements. Plants must be re-inspected by the project's ecologist and/or landscape designer prior to installation.

Damaged plants
Damaged, dried out, or otherwise mishandled plants will be rejected at installation inspection. All rejected plants shall be immediately removed from the site.

Plant Names
Plant names shall comply with those generally accepted in the native plant nursery trade. Any question regarding plant species or variety shall be referred to the project's ecologist or City staff. All plant materials shall be true to species and variety and legibly tagged.

Quality and condition
Plants shall be normal in pattern of growth, healthy, well-branched, vigorous, with well-developed root systems, and free of pests and diseases. Damaged, diseased, pest-infested, scraped, bruised, dried out, burned, broken, or defective plants will be rejected. Plants with pruning wounds over 1-inch in diameter will be rejected.

Roots
All plants shall be containerized, unless explicitly authorized by the landscape designer and/or the project's ecologist. Rootbound plants or plants with damaged, cracked, or loose rootballs (major damage) will be rejected. Immediately before installation, plants with minor root damage (some broken and/or twisted roots) must be root-pruned. Matted or circling roots of containerized plantings must be pruned or straightened and the sides of the root ball must be roughened from top to bottom to a depth of approximately half an inch in two to four places.

Sizes
Plant sizes shall be the size indicated in the plant schedule in approved plans. Larger stock may be acceptable provided that it has not been cut back to the size specified, and that the root ball is proportionate to the size of the plant. Smaller stock may be acceptable, and preferable under some circumstances, based on site-specific conditions. Measurements, caliper, branching, and balling and burlapping shall conform to the American Standard of Nursery Stock by the American Association of Nurserymen (latest edition).

Form
Evergreen trees shall have single trunks and symmetrical, well-developed form. Deciduous trees shall be single trunked unless specified as multi-stem in the plant schedule. Shrubs shall have multiple stems and be well-branched.

Timing of Planting
Unless otherwise approved by City staff and/or project's ecologist, all planting shall occur between November 1 and March 1. Overall, the earlier plants go into the ground during the dormant period, the more time they have to adapt to the site and extend their root systems before the water demands of spring and summer.

Weeding
Existing and exotic vegetation in the mitigation areas will be hand-weeded from around all newly installed plants at the time of installation and on a routine basis throughout the monitoring period. No chemical control of vegetation on any portion of the site is recommended.

Site conditions
The contractor shall immediately notify the project's ecologist of drainage or soil conditions likely to be detrimental to the growth or survival of plants. Planting operations shall not be conducted under the following conditions: freezing weather, when the ground is frozen, excessively wet weather, excessively windy weather, or in excessive heat.

Planting Pits
Planting pits shall be circular or square with vertical sides, and shall be 6" deeper and 12" larger in diameter than the root ball of the plant. Break up the sides of the pit in compacted soils. Set plants upright in pits. Burlap shall be removed from the planting pit. Backfill shall be worked back into holes such that air pockets are removed without adversely compacting down soils.

Fertilizer
Slow release fertilizer may be used if pre-approved by the City of Issaquah staff. Fertilizers shall be applied only at the base of plantings underneath the required covering of mulch (that does not contact stems of the plants). No soil amendment or fertilizers will be placed in planting holes.

Staking
Most shrubs and many trees DO NOT require any staking. If the plant can stand alone without staking in a moderate wind, do not use a stake. If the plant needs support, then strapping or webbing should be used as low as possible on the trunk to loosely brace the tree with two stakes. Do not brace the tree tightly or too high on the trunk. If the tree is unable to sway, it will further lose the ability to support itself. Do not use wire in a rubber hose for strapping as it exerts too much pressure on the bark. As soon as supporting the plant becomes unnecessary, remove the stakes. All stakes must be removed within two (2) years of installation.

Plant Location
Colored surveyors' ribbon or other appropriate marking shall be attached to the installed plants to assist in locating the plants while removing the competing non-native vegetation and during the monitoring period.

Arrangement and Spacing
The plants shall be arranged in a pattern with the appropriate numbers, sizes, species, and distribution that are required in accordance with the approved plans. The actual placement of individual plants shall mimic natural, asymmetric vegetation patterns found on similar undisturbed sites in the area. Spacing of the plantings may be adjusted to maintain existing vegetation with the agreement of the project's ecologist and/or City staff.

Inspection(s)
The project's ecologist shall be present on site to inspect the plants prior to planting. Minor adjustments to the original design may be required prior to and during construction.

Woodchip Mulch
After buffer enhancement plant installation, a 36" circle of no less than 2 to 4 inches of organic/untreated woodchips shall be placed around the base of each plant. Woodchips shall be kept well away (at least 2 inches) from the trunks and stems of woody plants.

6.0 PROJECT MONITORING PROGRAM

Requirements for monitoring project:
1. Initial compliance/as-built report
2. Site inspection (twice per year) for five years
3. Annual reports (one report submitted during each monitored year)

Purpose for Monitoring
The purpose for monitoring this mitigation project shall be to evaluate its success. Success will be determined if monitoring shows at the end of five years that the definitions of success stated below are met. The property owner shall grant access to the mitigation area for inspection and maintenance to the contracted landscape and/or wetland specialist and City of Issaquah during the monitoring period or until the project is evaluated as successful.

Monitoring
Monitoring shall be conducted twice annually for five years in accordance with the approved Mitigation Plan. The monitoring period will begin once the City receives written notification confirming the mitigation plan has been implemented and City staff inspects the site and issues approval of the installation.

Vegetation Monitoring
Sampling points will be established for vegetation monitoring and photo points will be established from which photos will be taken throughout the monitoring period. Permanent sampling points must be identified on the mitigation site plans in the first monitoring report (they may be drawn on approved plans by hand). Each sampling point shall quantity of plants and/or detail herbaceous, shrub, and tree coverage as needed to demonstrate compliance with the definitions of success below. Monitoring of vegetation sampling points shall occur once per monitored year.

Photo points
No less than three permanent photo points will be established within the mitigation areas. Photographs will be taken from these points to visually record condition of the enhancement area. Photos shall be taken annually between May 15 and September 30 (prior to leaf drop), unless otherwise specified.

Monitoring Report Contents
Monitoring reports shall be submitted by December 31 of each year during the monitoring period. As applicable, monitoring reports must include descriptions / data for:
1. Site plan and vicinity map
2. Historic description of project, including date of installation, current year of monitoring, restatement of mitigation / restoration goals, and performance standards
3. Plant survival, vigor, and areal coverage for every plant community (transect or sampling point data), and explanation of monitoring methodology in the context of assessing performance standards
4. Slope condition, site stability, any structures or special features

5. Buffer conditions, e.g., surrounding land use, use by humans, and/or wild and domestic creatures
6. Observed wildlife, including amphibians, avians, and others
7. Assessment of nuisance / exotic biota and recommendations for management
8. Color photographs taken from permanent photo-points that shall be depicted on the monitoring report map

6.1 CRITERIA FOR SUCCESS

Upon completion of the proposed buffer restoration plantings, an inspection by a qualified biologist/ecologist will be made to determine plan compliance. A compliance report will be supplied to the City of Issaquah within 30 days after the completion of planting. A landscape professional or the project's ecologist will perform condition monitoring of the plantings twice annually in the spring and fall. A written report describing the monitoring results will be submitted to the City for each monitored year. Final inspection will occur five years after completion of this project. The contracted consultant will prepare a report as to the success of the project.

6.1.1 Mitigation Plan Objective

The objective of this buffer restoration plan is to enhance the riparian area adjacent to Issaquah Creek through removal of invasive species and installation of native plants. This objective will be accomplished if the project meets the definition of success below.

6.1.2 Definition of Success

The planting areas shall meet the following performance standards:

a) End of Year 1: 100 percent survival of newly planted species and less than 10 percent cover of weedy/invasive species,
b) End of Year 3: 80 percent survival of newly planted species and less than 10 percent cover of weedy/invasive species,
c) End of Year 5: at least 70 percent aerial cover of native woody plant species, mitigation plantings must contain at least 6 native tree/shrub species, and less than 15 percent cover of weedy/invasive species. Volunteering native species will be included in the aerial cover calculation.

The species mix should resemble that proposed in the planting plans, but strict adherence to obtaining all of the species shall not be a criterion for success.

6.2 MAINTENANCE

The mitigation areas will require periodic maintenance to remove undesirable species and replace vegetation mortality. Maintenance shall occur in accordance with the approved plans. Chemical control, only if approved by City staff, shall be applied by a licensed applicator following all label instructions.

Duration and Extent
In order to achieve performance standards, the permittee shall have the mitigation area maintained for the duration of the five-year monitoring period. Maintenance will include: watering, weeding around the base of installed plants, pruning, replacement, re-staking, removal of all classes of noxious weeds (see Washington State Noxious Weeds List, WAC 16-750-005) as well as Himalayan blackberry, and any other measures needed to ensure plant survival. The landscape designer and/or the project's ecologist shall direct all maintenance.

Survival
The permittee shall be responsible for the health of 100% of all newly installed plants for *one growing season* after installation has been accepted by the City of Issaquah. A growing season for these purposes is defined as occurring from spring to spring (March 15 to March 15 of the following year). For fall installation (often required), the growing season will begin the following spring. The permittee shall replace any plants that are: failing, weak, defective in manner of growth, or dead during this growing season, as directed by the landscape designer, the project's ecologist, and/or City of Issaquah staff.

Installation Timing for Replacement Plants
Replacement plants shall be installed between October 15 and January 15, unless otherwise determined by the project's ecologist and/or City of Issaquah staff.

Standards for Replacement Plants
Replacement plants shall meet the same standards for size and type as those specified for the original installation, unless otherwise directed by the project's ecologist and/or City of Issaquah staff.

Replanting
Plants that have settled in their planting pits too deep, too shallow, loose, or crooked shall be replanted as directed by the project's ecologist and/or City of Issaquah staff.

Herbicides/Pesticides
Chemical controls shall not be used in the mitigation area, sensitive areas, or their buffers. However, limited use of herbicides may be approved depending on site-specific conditions, only if approved by City of Issaquah staff.

Irrigation/Watering
Water should be provided during the dry season (July 1 through October 15) for the first two years after installation to ensure plant survival and establishment. A temporary above ground irrigation system, current irrigation, or other measures (water truck, hand watering) may be used to provide water. Water should be applied at a rate of 1" of water twice per week for year one and 1" per

week during year two. If the mitigation plantings meet 80 percent survival at the end of year two, watering may cease if approved by the project's ecologist.

General
The permittee shall include in general maintenance activities the replacement of any vandalized or damaged signs, habitat features, fences, or other structural components of this mitigation site.

6.3 CONTINGENCY PLAN

If 20% of the plants are severely stressed during any of the inspections, or it appears 20% may not survive, additional plantings will be added to the planting area. Elements of a contingency plan may include but will not be limited to: more aggressive weed control, pest control, mulching, replanting with larger plant material, species substitution, fertilization, soil amendments, and/or irrigation.

7.0 USE OF THIS REPORT

This Critical Area Study and Buffer Mitigation Plan is supplied to Issaquah School District as a means of determining on-site wetland and stream conditions, as required by the City of Issaquah during the permitting process. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

The laws applicable to wetlands are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in effect.

The work for this report has conformed to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report, and any implied representation or warranty is disclaimed.

Wetland Resources, Inc.

Meryl Kamowski, PWS
Senior Ecologist

8.0 REFERENCES

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USFWS. 2021. National Wetlands Inventory (NWI) Online Mapper. http://www.fws.gov/wetlands/Data/Mapper.html.

WA Department of Natural Resources. 2021a. *Forest Practices Activity Mapping Tool.* http://fortress.wa.gov/dnr/app1/fpars/viewer.htm

WDFW.2021a. Priority Habitat and Species (PHS) Interactive Map. http://apps.wdfw.wa.gov/phsontheweb/.

WDFW. 2021b. SalmonScape Online Mapping Application. http://apps.wdfw.wa.gov/salmonscape/map.html.

APPENDIX A:
FISH EXCLUSION PROTOCOL

October 29, 2021

Issaquah School District #411
Attn: Janelle Walker
5150 220th Ave SE
Issaquah, WA 98029

RE: Fish Exclusion Protocol for Holly Street Campus - Bank Erosion Repair Project

Wetland Resources, Inc. follows the fish exclusion protocols listed below. In addition to these general protocols, the project will adhere to any additional requirements stipulated within permits issued from WA State Department of Fish and Wildlife, WA State Department of Ecology, and the US Army Corps of Engineers.

Fish Exclusion Protocols

1. Set block nets (fish screens) upstream and downstream of work area. An upstream block net will be placed first. With a block net secured to prevent movement of fish into the work area from upstream, a second block net will be used as a seine to herd fish in a downstream direction.

a) Field staff will be assigned the responsibility of frequently checking and maintaining the nets for accumulated debris, general stability, and proper function.

2. Establish cofferdam (or similar) and bypass pump with fish screen to divert water from the work area. Fish screens or guards will comply with Washington State law (RCW 77.57.010 and 77.57.070) and will comply with any provisions contained in the Hydraulic Project Approval (HPA).

3. Heard fish out of work area, net and release fish to downstream areas. Care will be taken not to concentrate fish where they are exposed to sources of stress, or to leave them concentrated in such areas for a long duration (e.g., more than 30 minutes).

4. The directing biologist will ensure that fish capture and removal operations adhere to the following minimum performance measures or expectations:

a) Only dip nets and seines composed of soft (non-abrasive) nylon material will be used.

b) The operations will not resort to the use of electrofishing equipment unless and until other, less injurious methods have removed most or all of the adult and sub-adult fish (i.e.,

fish in excess of 300 millimeters); the operations will conduct a minimum of three complete passes without capture using seines and/or nets prior to the use of electrofishing.

c) The operations will confirm success of fish capture and removal before completely dewatering or commencing with other work within the isolated work area; the operations will conduct a minimum of two complete passes without capture using electrofishing equipment.

d) Fish will not be held in containers for more than 10 minutes, unless those containers are dark-colored, lidded, and fitted with a portable aerator.

e) A plan for achieving efficient return to appropriate habitat will be developed before the capture and removal process.

f) Every attempt will be made to release ESA-listed specimens first.

5) Electrofishing will be performed only when other methods of fish capture and removal have proven impracticable or ineffective at removing all fish. The directing biologist will ensure that attempts to seine and/or net fish always precede the use of electrofishing equipment. Larger fish (i.e., adult and sub-adult fish with comparatively longer spine lengths) are more susceptible to electrofishing injury than smaller fish. To minimize the risk of injury (and the number of fish potentially injured), the directing biologist will confirm that other methods have been effective in removing most or all of the adult and sub-adult fish before resorting to the use of electrofishing equipment. As a general rule or performance measure, electrofishing will not be conducted under conditions that offer poor visibility (i.e., visibility of less than 0.5 meter).

Electrofishing will be conducted in a manner that minimizes harm to fish. Once an appropriate fish response (galvanotaxis) is achieved, the isolated work area will be worked systematically. The number of passes will be kept to a minimum, but is dependent upon the numbers of fish and site characteristics and will be at the discretion of the directing biologist. Care will be taken to remove fish from the electrical field immediately and to avoid exposing the same fish repeatedly. Fish will not be held in dip nets while electrofishing is in progress (i.e., while continuing to capture additional fish). The directing biologist will also review and consider changes to the manner in which the electrofishing attempt is proceeding. If adjustments to the electrofishing attempt do not lessen the frequency (or severity) of observed stress, the directing biologist will have the authority to postpone fish capture and removal operations. Each fish must be capable of remaining upright and actively swimming prior to release.

Should you have any questions, do not hesitate to contact our office at (425) 337-3174.

Wetland Resources, Inc.

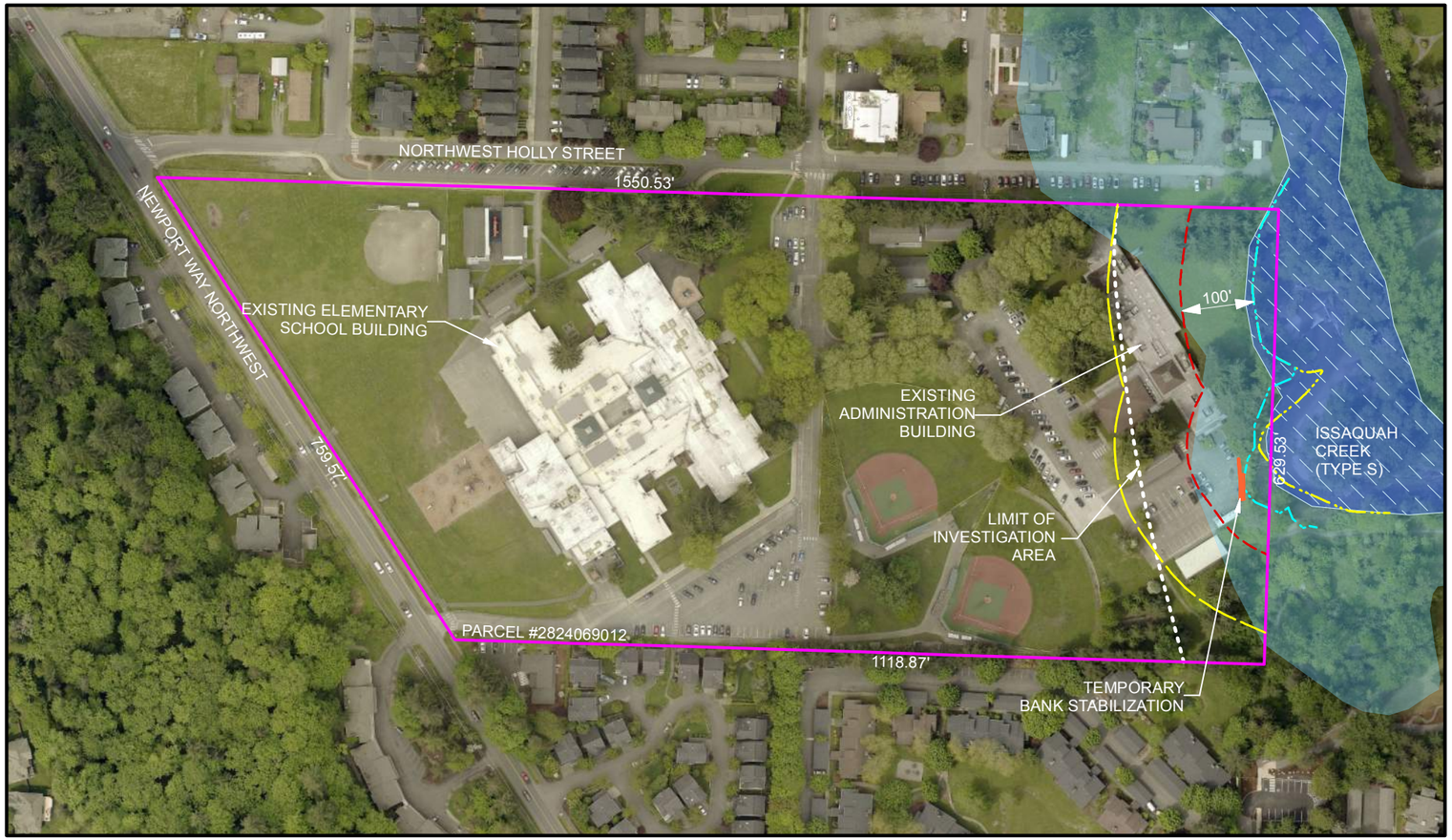
Meryl Kamowski, PWS
Senior Ecologist

APPENDIX B:
CRITICAL AREA STUDY AND BUFFER MITIGATION PLAN MAPS

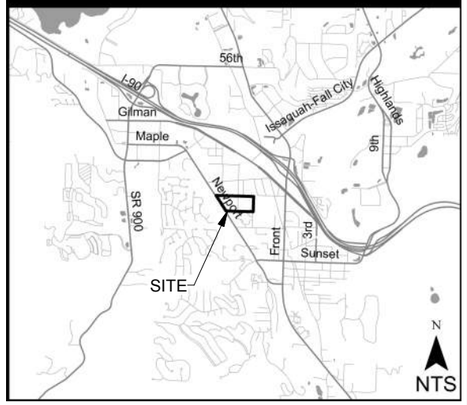
EXISTING CONDITIONS MAP

HOLLY STREET CAMPUS - CREEK BANK REPAIR

PORTION OF SECTION 28, TOWNSHIP 24N, RANGE 06E, W.M.



VICINITY MAP



LEGEND

- PROPERTY BOUNDARY
- ORDINARY HIGH WATER MARK (PRIOR TO EROSION EVENT)
- ORDINARY HIGH WATER MARK (CURRENT)
- STREAM BUFFER
- EXTENT OF SHORELINE JURISDICTION
- LIMIT OF INVESTIGATION AREA
- FEMA PRELIMINARY FLOODWAY (KING COUNTY IMAP)
- FEMA PRELIMINARY 100-YEAR FLOODPLAIN (KING COUNTY IMAP)

Scale 1" = 200'

0 100 200 300 400

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance
9505 19th Avenue S.E. Suite 106 Everett, Washington 98208
Phone: (425) 337-3174
Fax: (425) 337-3045
Email: mailbox@wetlandresources.com

Existing Conditions Map
Holly Street Campus - Creek Bank Repair
City of Issaquah

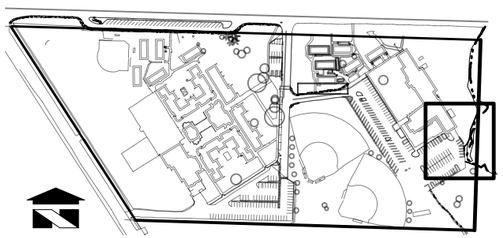
Issaquah School District
Attn: Janelle Walker
5150 220th Ave SE
Issaquah, WA 98029

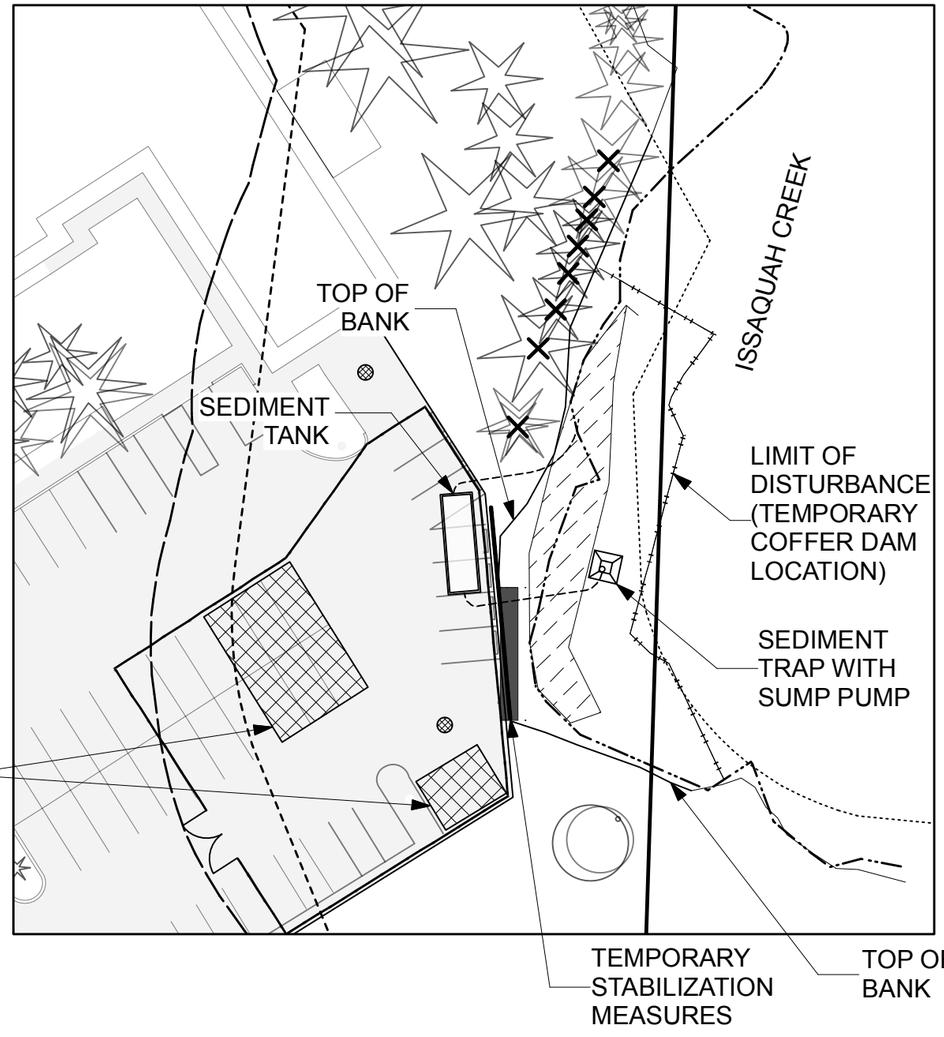
Sheet 1/4
WRI Job#: 21034
Drawn by: MK
Date: 11/02/2021

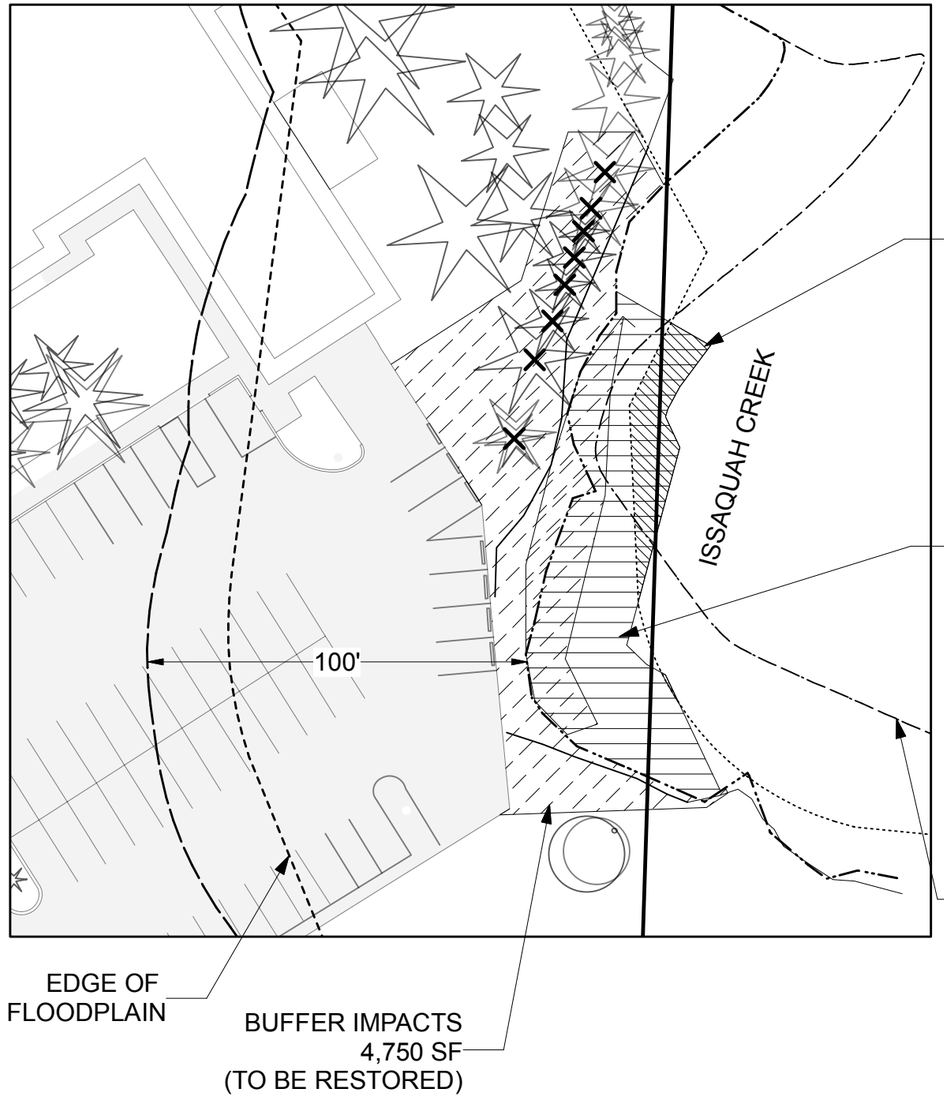
WORK AREA PREPARATION AND IMPACTS
HOLLY STREET CAMPUS - CREEK BANK REPAIR

PORTION OF SECTION 28, TOWNSHIP 24N, RANGE 06E, W.M.

HOLLY STREET CAMPUS







LEGEND	
OHWM (HISTORIC)	TREE TO BE REMOVED
OHWM (CURRENT)	BUFFER IMPACTS
STREAM BUFFER	WORK AREA IN FLOODWAY
FEMA PRELIMINARY 100-YEAR FLOODPLAIN	WORK AREA IN OHWM
FEMA PRELIMINARY FLOODWAY	

Scale 1" = 40'

0 20 40 60 80

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Work Area Preparation and Impacts
Holly Street Campus - Creek Bank Repair
City of Issaquah

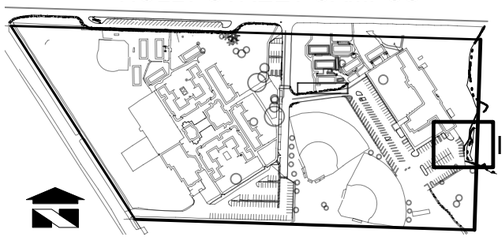
Issaquah School District
Attn: Janelle Walker
5150 220th Ave SE
Issaquah, WA 98029

Sheet 2/4
WRI Job#: 21034
Drawn by: MK
Date: 11/02/2021

PERMANENT BANK STABILIZATION PLAN
HOLLY STREET CAMPUS - CREEK BANK REPAIR

PORTION OF SECTION 28, TOWNSHIP 24N, RANGE 06E, W.M.

HOLLY STREET CAMPUS



Scale 1" = 20'

0 10 20 30 40

LEGEND

- HISTORIC ORDINARY HIGH WATER MARK
- ORDINARY HIGH WATER MARK
- STREAM BUFFER
- FEMA PRELIMINARY 100-YEAR FLOODPLAIN
- FEMA PRELIMINARY FLOODWAY

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Permanent Bank Stabilization Plan
Holly Street Campus - Creek Bank Repair
City of Issaquah

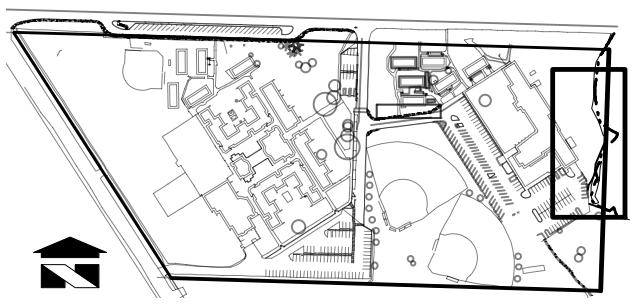
Issaquah School District
Attn: Janelle Walker
5150 220th Ave SE
Issaquah, WA 98029

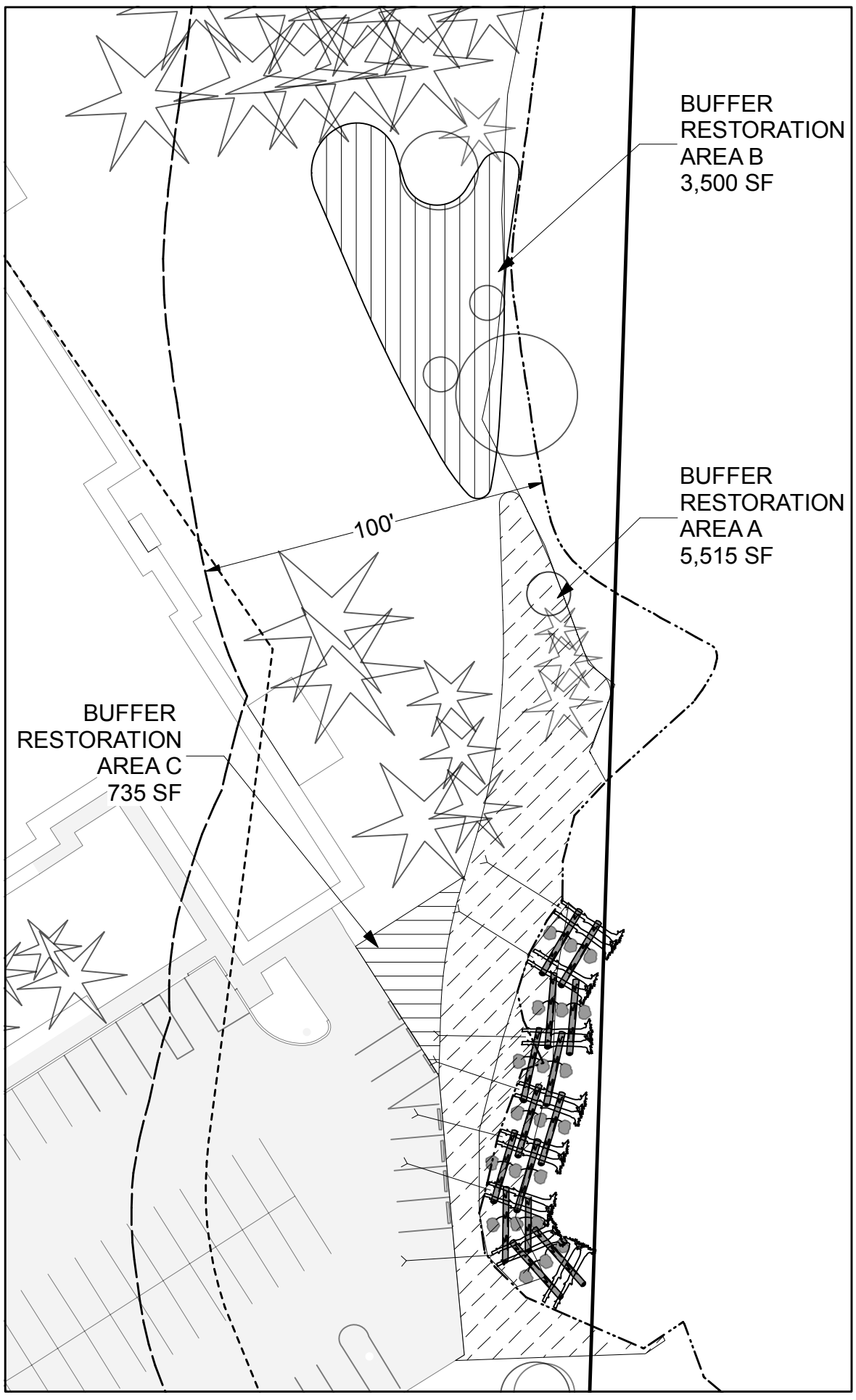
Sheet 2/3
WRI Job#: 21034
Drawn by: MK
Date: 11/02/2021

BUFFER MITIGATION PLAN
HOLLY STREET CAMPUS - CREEK BANK REPAIR

PORTION OF SECTION 28, TOWNSHIP 24N, RANGE 06E, W.M.

HOLLY STREET CAMPUS





LEGEND

- ORDINARY HIGH WATER MARK (CURRENT)
- STREAM BUFFER
- FEMA PRELIMINARY 100-YEAR FLOODPLAIN
- BUFFER RESTORATION AREA A
- BUFFER RESTORATION AREA B
- BUFFER RESTORATION AREA C

Scale 1" = 40'

0 20 40 60 80

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Buffer Mitigation Plan
Holly Street Campus - Creek Bank Repair
City of Issaquah

Issaquah School District
Attn: Janelle Walker
5150 220th Ave SE
Issaquah, WA 98029

Sheet 4/4
WRI Job#: 21034
Drawn by: MK
Date: 11/02/2021

Exhibit 7

Doug Yormick

From: Walker, Janelle <WalkerJ2@issaquah.wednet.edu>
Sent: Friday, April 8, 2022 8:49 AM
To: Connie Marsh
Cc: Doug Yormick; Tom Mullins
Subject: ISD Holly Street Permanent Creek Bank Stabilization - Neighborhood Comments

Per your request at the April 6, 2022 neighborhood meeting for the Holly Street Permanent Creek Bank Stabilization below (in BLUE) are the responses your questions Doug sent us prior to the meeting.
Thank You

Janelle Walker
Capital Projects
Issaquah School District
425-306-4022 – Cell
425-837-7036 - Work

-----Original Message-----
From: Doug Yormick <DougY@issaquahwa.gov>
Sent: Wednesday, April 6, 2022 11:26 AM
To: Walker, Janelle <WalkerJ2@issaquah.wednet.edu>
Subject: FW: Holly Street Stabilization

FYI on a comment that came in regarding Holly Streambank meeting. Please forward to your team and be prepared to provide a response.

Doug Yormick
Associate Environmental Planner
Community Planning and Development
1775 12th Ave NW
Issaquah, WA 98027
425.837.3083
dougy@issaquahwa.gov

-----Original Message-----
From: Connie Marsh <auntgrumpy@comcast.net>
Sent: Wednesday, March 30, 2022 6:42 PM
To: Doug Yormick <DougY@issaquahwa.gov>
Subject: Holly Street Stabilization

Hi Doug,

The studies for this stabilization do not follow our SMP requirement to use WDFW guidance for bank hardening. Instead they used a forest practices manual.
ISD Response: We used the forest practices board manual only to define the channel migration hazard zone since the City of Issaquah has not selected a preferred manual, so the State manual governs; the Integrated Streambank Protection Guidelines (WDFW, 2003) was in fact used to screen alternatives and develop stabilization recommendations, in accordance with the City's Shoreline Master Program (SMP).

Clearly the better answer is to remove the asphalt from the stream buffer and accommodate channel migration while working to minimize erosion.
ISD Response: We analyzed alternative approaches to bank stabilization including the 'no action' alternative. The concrete parking lot and subsurface utilities represent a public resource for which removal is not a preferred option.

The information indicates that a near term development proposal is forthcoming that would require the District get out of the buffer anyway.
ISD Response: The project team is not aware of a near-term development proposal; if this is in regards to the Holly Street Building adjacent to the parking lot, the building is currently permitted and under construction for the Early Learning Center Tenant Improvement. No further "redevelopment" of the property is proposed in the near future.

This project needs to be considered along with a redevelopment concept.
ISD Response: If this is in regards to the Holly Street Building adjacent to the parking lot, the building is currently permitted and under construction for the Early Learning Center Tenant Improvement. As part of the Early Learning Center TI a project to construction an associated playground is currently in design, but not in the vicinity of the creek bank repair. No further "redevelopment" of the property is proposed in the near future.

Hazardous trees are supposed to remain in the buffer per WDFW…as habitat etc. Creating snags and dropping the trees in place seems to be favored.
ISD Response: The plan utilizes the hazardous trees on the site within the carefully-constructed bank protection. Not only does this reduce cost, but it is compliant with programmatic requirements from FEMA and the Army Corps of Engineers. WDFW is aware of the design.

The chart has the coverage versus vegetative survival switched with what is in text. If this needs an HPA then one would expect a 10 year monitoring period.
ISD Response: WDFW will outline monitoring periods upon their final review of the project plans. We are monitoring the site regardless for 5 years per the City of Issaquah and 10 years per the Army Corps of Engineer's requirements.

The SMP requires peer review.
ISD Response: The City of Issaquah will be issuing corrections for compliance with the SMP after their review of the project plans. Peer review is expected. The Critical Area Study report prepared by Wetland Resources was submitted with our Shoreline permit application and demonstrates compliance with the SMP and the mitigation plantings proposed.

I have linked the WDFW guidance below.
https://wdfw.wa.gov/sites/default/files/publications/00046/wdfw00046.pdf
ISD Response: The Geologist, Nelson Geotechnical Associates, maintains a physical copy of this guidance on-site whenever their representatives are present. The document was foundational to the recommendations of the geotechnical report and design of the project.

Thanks,

Connie Marsh

CITY OF ISSAQUAH WASHINGTON

Community Planning & Development
1775 – 12th Ave NW | P.O. Box 1307
Issaquah, WA 98027
425-837-3100
issaquahwa.gov

DETERMINATION OF NON-SIGNIFICANCE (DNS)

File Number:	SEP22-00001
Applied:	January 7, 2022
Issue Date:	May 6, 2022
Applicant:	Janelle Walker, Issaquah School District
Lead Agency:	City of Issaquah

Description of Proposal: The permanent stabilization project will remove temporary repair and then install bio-engineered streambank protection along approximately 130 feet of streambank along the west side of Issaquah Creek. Protection will include reconstruction of a portion of the bank lost to channel erosion in proximity to Issaquah School District infrastructure with an engineered, non-deformable log toe incorporating large woody debris and habitat boulders. Mechanical anchors are included in the design to add additional security for the large woody debris into the undisturbed streambank and channel, although habitat boulders will anchor the debris for normal and moderately high flow flood stages of the stream. As the bioengineered structure decays, revegetation within the reconstructed bank will take hold and form permanent, long-term stabilization.

Location of Proposal: 565 NW Holly Street; King County Parcel Number 2824069012

Determinitation: The City of Issaquah's SEPA Responsible Official has determined that this proposal will not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed Environmental Checklist received January 7, 2022, and the supplemental information provided with the project application on file with the lead agency. This information is available to the public upon request.

The project planner is Doug Yormick, who may be contacted at (425) 837-3083 for further information.

Minnie Dhaliwal

Minnie Dhaliwal, SEPA Responsible Official
City of Issaquah
1775 12th Ave NW
Issaquah, WA 98027
(425) 837-3430

May 6th,2022
Date

Appeal Period: This DNS is issued under WAC 197-11-340. There is a 14-day comment/appeal period for this determination, between May 6, 2022, to May 20, 2022. Anyone wishing to comment may submit written comments to the Responsible Official. The Responsible Official will consider the determination based on timely comments. Any person aggrieved by this determination may appeal by filing a Notice of Appeal with the City of Issaquah Permit Center. Appellants should prepare specific factual objections. Copies of the environmental determination and other project application materials are available from the City of Issaquah Community Planning and Development Department, 130 East Sunset Way.

Appeals of this SEPA determination must be consolidated with appeal of the underlying permit, per IMC 18.04.250.

Cc: Washington State Department of Ecology
Snoqualmie Indian Tribe
Washington State Department of Fish and Wildlife
Washington State Department of Archeology and Historic Preservation (DAHP)
Parties of Record
Muckleshoot Indian Tribe
U.S. Army Corps of Engineers
Properties within 300-feet of proposal